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CORRECTIVE MEASURES STUDY WORK PLAN ZONE H CNC CHARLESTON SC
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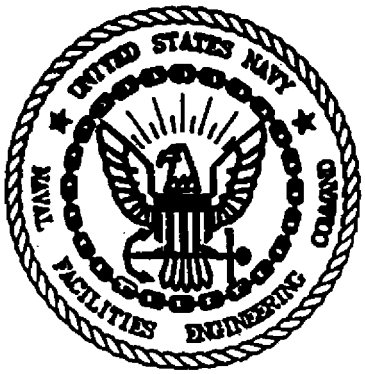


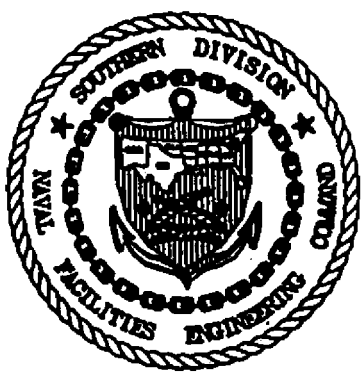
COMPREHENSIVE LONG-TERM ENVIRONMENTAL ACTION NAVY NAVAL BASE CHARLESTON CHARLESTON, SOUTH CAROLINA CTO-029

ZONE H CORRECTIVE MEASURES STUDY WORK PLAN

Prepared for:

DEPARTMENT OF THE NAVY
SOUTHERN DIVISION
NAVAL FACILITIES ENGINEERING COMMAND
CHARLESTON, SOUTH CAROLINA

SOUTHDIV CONTRACT NUMBER: N62467-89-D-0318



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Release of this document requires the prior notification of the Commanding Officer of the Naval Base Charleston, Charleston, South Carolina.

Table of Contents

List of Figures

List of Tables

List of Appendices

ACRONYM LIST

ACL	Alternate Concentration Limit
AFCEE	Air Force Center for Environmental Excellence
AOC	Area of Concern
AST	Above Ground Storage Tank
BEHP	Bis(2-ethylhexyl)phthalate
BEQ	Benzo[a]pyrene Equivalents
bgs	Below Groundwater Surface
BOD	Biological Oxygen Demand
CAP	Corrective Action Process
CDI	Chronic Daily Intake
CEX	Cation Exchange Capacity
CMI	Corrective Measures Implementation
CMS	Corrective Measures Study
COC	Contaminant of Concern
COD	Chemical Oxygen Demand
CRP	Community Relations Plan
DANC	Decontaminating Agent Non-corrosive
DCE	1,2-dichloroethene
DET	Environmental Detachment
DGW	Deep Groundwater
DMP	Data Management Plan
DNAPL	Dense Non-aqueous Phase Liquid
DNT	Dinitrotoluene
E/A&H	EnSafe/Allen & Hoshall
Eh	Redox Potential
EOD	Explosive Ordnance Disposal
EPA	Environmental Protection Agency
ft/day	Feet/Day
ft/ft	Feet/Foot
GW	Groundwater
HASP	Health and Safety Plan
HI	Hazard Index
ISM	Interim Stabilization Measures
ILCR	Incremental Lifetime Cancer Risk

Acronym List (Continued)

Kv	Vertical Hudraulic Conductivity
LNAPL	Light Non-aqueous Phase Liquid
MC	Moisture Content
MCL	Maximum Contaminant Level
mg/kg	Milligram per kilogram
mg/L	Milligram per liter
NA	Not Applicable
NAPL	Non-aqueous Phase Liquid
ND	Non-Detect
NFA	No Further Action
NL	Not Listed
NPDES	National Pollution Discharge Elimination System
OIA	Other Impacted Area
PCB	Polychlorinated Biphenyl
PCP	Pentachlorophenol
pH	Hydrogen Ion Concentration
POTW	Publicly Owned Treatment Works
PST	Petroleum Storage Tank
QAP	Quality Assurance Plan
RBC	Risk-Based Concentration
RCRA	Resource Conservation and Recovery Act
RDX	Cyclonite
RFA	RCRA Facility Assessment
RFI	RCRA Facility Investigation
SAA	Satellite Accumulation Area
SAP	Sampling and Analysis Plan
SCDHEC	South Carolina Department of Health and Environmental Control
SGW	Shallow Groundwater
SMCL	Secondary Maximum Containment Level
SSL	Soil Screening Level
SVE	Soil Vapor Extraction
SVOC	Semivolatile Organic Compound
SWMU	Solid Waste Management Unit
TCDD	Tetrachlorodibenzo-p-dioxin
TCE	Trichloroethylene

Acronym List (Continued)

TCLP	Toxicity Characteristic Leaching Procedure
TDS	Total Dissolved Solids
TNT	Trinitrotoluene
TOC	Total Organic Carbon
TSDF	Treatment, Storage and Disposal Facility
TPH	Total Petroleum Hydrocarbon
TSS	Total Suspended Solids
USBPTA	United States Border Patrol Training Academy
USEPA	United States Environmental Protection Agency
UST	Underground Storage Tank
UTL	Upper Tolerance Limit
UV	Ultraviolet
UXO	Unexploded Ordnance
VOA	Volatile Organic Analysis
VOC	Volatile Organic Compound
WQ	Water Quality
µg/dL	Microgram per decaliter
µg/kg	Microgram per kilogram
µg/L	Microgram per liter

1.0 DESCRIPTION OF THE RCRA CAP PROCESS

The Resource Conservation and Recovery Act (RCRA) Corrective Action Program (CAP) consists of a series of actions typically required at permitted facilities at which a release has occurred from a solid waste management unit (SWMU) or area of concern (AOC). Consent orders issued by an authorizing agency can also require that a facility establish and begin a RCRA CAP.

The environmental investigation and remediation at the former Charleston Naval Base and Shipyard are required by the Hazardous and Solid Waste Amendments section of the facility's RCRA Part B permit. This work plan describes the corrective measures study portion of the RCRA CAP for Zone H at the former military base.

The following sites are included in the Zone H corrective measures study and are further discussed in this work plan:

- Combined SWMU 9 (including SWMUs 19, 20, and 121, and AOCs 649, 650, and 651)
- Combined SWMU 14 (including SWMU 15 and AOCs 670 and 684)
- SWMU 17
- SWMU 136 and AOC 663
- SWMU 159
- AOC 503
- AOC 653
- AOC 655
- AOC 656
- AOC 666

1.1 Components of the RCRA CAP

A RCRA CAP may consist of the following five actions, as well as other actions not listed:

- Action 1 — RCRA Facility Assessment (RFA)
- Action 2 — RCRA Facility Investigation (RFI)
- Action 3 — Interim Stabilization Measures (ISM)
- Action 4 — Corrective Measures Study (CMS)
- Action 5 — Corrective Measures Implementation (CMI)

The RFA is the initial assessment and investigation of releases at the subject facility. This step is noninvasive (e.g., no environmental media are sampled) and it primarily reviews the facility's history of releases. Should there be sufficient evidence of a release, the facility usually proceeds to the next stage of the program, an RFI, which is used to evaluate the nature and extent of the release and provide additional information to support a CMS, if warranted.

The CMS identifies and evaluates potential remedial alternatives for selected sites at the facility and is usually followed by the implementation of the one selected. This subsequent step (e.g., remedial alternative implementation) is referred to as the CMI.

ISMs are intended to control or abate immediate and extreme threats to human health and/or the environment from the release(s) and/or to prevent or reduce the further spread of contamination while long-term remedies are being developed. Per definition, this stabilization effort is not required for all sites. However, if emergency stabilization efforts are required, they generally occur during the first stage of corrective action, though they may also be conducted at any time during the process. The level of present threat and/or likelihood of potential threat to either human health or the environment from releases at the subject facility determines the time and the scope of ISM, if required.

1.2 Sequencing of the RCRA CAP

It is not necessary for the RCRA CAP to occur in the sequence indicated by the steps listed. Nor are all the steps required to satisfy the RCRA CAP. Every facility and every associated site release is unique. Therefore, the remedial action evaluation and cleanup process needs to be tailored to each facility and it should be directly related to the complexity of facility operations and the severity of its associated release(s).

In summary, the level of detail, and thus ensuing effort, of a corrective action program at a RCRA-regulated facility needs to be proportional to the actual risk to human health and/or the environment posed by facility-related contaminants.

2.0 DESCRIPTION OF THE CMS PROCESS

The CMS essentially starts with the selection of candidate sites for remedial alternative evaluation. As part of a risk management decision, the project team selects sites for inclusion into the CMS process. The decision is primarily based on applicable site conditions and the information obtained during the RFI process, such as risk level and the main risk drivers.

2.1 Objective

The CMS' overall objective is to identify, screen, evaluate, and rank potential remedial alternatives for sites that have been elevated into the CMS stage from the RFI.

This objective will be met by screening and evaluating potential alternatives against four threshold criteria and five balancing criteria. If more than one viable alternative is identified for the subject site, a matrix of ranked alternatives will be presented in the CMS report.

2.2 Inclusion Criteria

Sites with the following characteristics were included in the CMS process. However, as stated previously, final CMS site selection occurs as a result of risk management decisions made by the project team.

- Inclusion Criteria 1 — Sites at which surface soil posed an incremental lifetime excess cancer risk (ILCR) exceeding 1E-6, based on a maximum unrestricted reuse scenario (e.g., residential reuse).
- Inclusion Criteria 2 — Sites at which groundwater contaminants exceeded applicable maximum contaminant levels (MCLs) or other promulgated standards, as defined by the project team, and/or groundwater with residential risk exceeding 1E-6.
- Inclusion Criteria 3 — Sites recommended for further consideration by the project team.

2.3 Threshold Criteria

Potential remedial technologies or alternatives have been listed for each site based on information from the current RFI, other field or support documents, professional experience, and project team input. Each potential remedial technology or alternative will then be then screened against four threshold criteria to determine its viability. Threshold criteria are considered primary criteria that must be met by the screened alternative for the alternative to be further considered as a viable candidate.

- Threshold Criteria 1 — Protection of human health and the environment
- Threshold Criteria 2 — Attainment of cleanup standards
- Threshold Criteria 3 — Source control
- Threshold Criteria 4 — Compliance with applicable waste management standards

Technologies or alternatives that pass this initial screening will be retained for further evaluation and comparison. In addition, ranking the alternatives may be required if more than one remedial option passes the initial screening. Formal, or secondary, screening typically requires engineering calculation, parameter estimation, or treatability/pilot study to determine technology effectiveness.

2.4 Balancing Criteria

If more than one remedial option is identified for the site, they are further evaluated against five balancing criteria. These secondary criteria can act as a tie-breaker for remedial alternatives that have met all four of the threshold criteria previously described.

- Balancing Criteria 1 — Long-term reliability and effectiveness
- Balancing Criteria 2 — Reduction in toxicity, mobility, or volume of wastes
- Balancing Criteria 3 — Short-term effectiveness

- Balancing Criteria 4 — Implementability
- Balancing Criteria 5 — Cost

The remedial alternative eventually selected for the site is usually the one that presents favorable overall balancing characteristics. However, it is important that the evaluation process consider site-specific constraints and remain flexible. It is possible that technology limitations, or other yet to-be-determined limitations, could drive the selection of a viable remedial alternative rather than media-specific cleanup goals driving remedy selection. Property reuse consideration is an example of a potential limiting factor.

2.5 Ranking of Alternatives

Alternatives will then be compared to each other and ranked, based on their ability to satisfy the nine criteria. The proposed alternative for the site's final remedy typically will consist of the alternative, or group of alternatives, that present the most cost-effective and technically feasible approach that can protect human health and the environment while obtaining realistic cleanup goals in a timely fashion, considering property reuse potential.

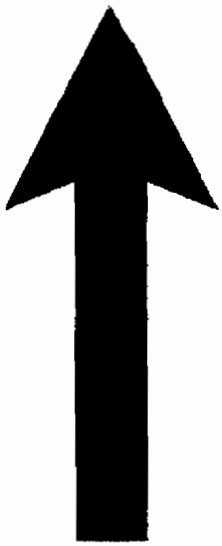
2.6 Public Participation

Public involvement and input regarding remedial alternative selection will be solicited during the CMS. However, public participation can also be solicited at anytime throughout the RCRA CAP. It is important to provide open communication to all stakeholders at the former Charleston Naval Base and Shipyard. The practice of early, and frequent, public involvement activities usually leads to informed and sincere public support of the project rather than public opposition through misunderstanding.

The CMS process is further described in *Volume I of the Comprehensive Corrective Measures Study Project Management Plan, EnSafe/Allen & Hoshall, June 1997.*

2.7 Final Remedy Selection

The United States Navy and the South Carolina Department of Health and Environmental Control (SCDHEC) will jointly lead the effort to select the final remedy for each site. The United States Environmental Protection Agency (USEPA) will assist the joint leaders during the selection process. Selection of the final remedy will consist of developing a statement of basis and an associated public involvement plan. Public feedback and input will be considered during final remedy selection.



SECTION 3

3.0 DESCRIPTION OF THE CMS WORK PLAN

This draft work plan describes the proposed CMS components for Zone H at the former Charleston Naval Base and Shipyard. Zone H is one of 12 investigative zones (A through L) that make up the former base. The designation of 12 separate investigative zones was necessary to effectively manage and expedite the environmental investigation of a large and multi-functional military facility.

The Draft Zone H CMS Work Plan consists of the following sections:

- Section 1 — Description of the RCRA CAP Process
- Section 2 — Description of the CMS Process
- Section 3 — Description of the CMS Work Plan
- Section 4 — CMS Site Selection
- Section 5 — Site-Specific Overview
- Section 6 — CMS Schedule and Report Outline
- Section 7 — References
- Section 8 — Signatory Requirement

3.1 Reference to the Comprehensive CMS Work Plan

A comprehensive CMS operational plan was written and finalized in June 1997 by EnSafe/Allen & Hoshall (E/A&H): *Final Comprehensive Corrective Measures Study Project Management and Work Plans (Volumes I and II), EnSafe/Allen & Hoshall, 1997.* These two volumes, which make up the comprehensive CMS work plan, detail the proposed approach to the overall CMS effort and its objective for the Charleston Naval Base complex.

It is not the intent of this zone-specific CMS work plan to develop or to restate the information previously presented in the comprehensive CMS work plan. Rather, it outlines brief approaches

to the CMS efforts for all Zone H applicable sites. Applicable sites are defined as those designated by the Charleston Naval Base Project Team as warranting a CMS under the RCRA Corrective Action Program. Section 4, *CMS Site Selection,* describes how sites are selected for the CMS. By using the comprehensive and zone-specific CMS work plans together, a more efficient and cost-effective CMS will be realized.

The comprehensive CMS work plan should be referenced for the following general plans:

- Sampling and analysis plan (SAP)
- Quality assurance plan (QAP)
- Health and safety plan (HASP)
- Data management plan (DMP)
- Community relations plan (CRP)

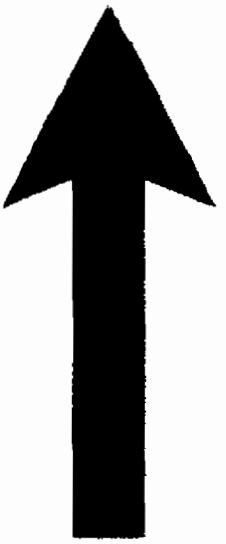
These general plans have previously been developed and approved for use during the RCRA Facility Investigation of the former naval base and shipyard. The comprehensive CMS work plan also presents the *overall* technical approach to the CMS effort, as well as project management details (e.g., typical project work elements, overall project schedule, and project management responsibilities). Zone-specific information is provided in the zone-specific CMS work plans such as this one.

3.2 Objective of Zone- or Site-Specific CMS Work Plans

The primary goal of this zone-specific work plan is to present the CMS process and the overall objectives proposed for Zone H only. Section 5, *Site-Specific Overview,* also states what supplemental data needs (additional site-specific field investigations, additional sampling and analysis, treatability, or pilot studies, etc.) are required to fully complete the CMS effort for each

applicable Zone H site. This data will supplement the site-specific information previously obtained during the Zone H RCRA Facility Investigation.

Most importantly, the site-specific work plan will present remedial objectives consistent with property reuse plans as currently identified by the Charleston Naval Complex Re-Development Authority.



SECTION 4

4.0 CMS SITE SELECTION

This section describes how Zone H sites were selected for the CMS process. Zone H sites were separated into the three categories described below. This work plan has been developed as a result of the identification of CMS-designated sites.

It is important to note that the project team included a site in the CMS process based primarily on residential risk exceedence (e.g., greater than 1E-6 risk). The inclusion process did not directly consider contaminant extent, frequency, type or other subjective, yet relevant factors, such as property reuse plans.

4.1 The Use of Risk Management

Risk management decisions for the CMS site selection process, which were made by project team consensus, were based primarily on risk assessment results. The risk management process for CMS site selection allowed the project team to categorize each Zone H investigated site into one of the three following categories.

- Category I — No further action (NFA) sites
- Category II — CMS sites
- Category III — Petroleum storage tank (PST) sites

4.2 Category I — NFA Sites

Sites designated as NFA require no further investigative or remedial action within the RCRA CAP (e.g., regarding RCRA Subtitle C); therefore, they are eliminated from further RCRA CAP-driven activity. Essentially, these sites have been assessed and risks have been quantified and qualified. Given the absence of any substantial risk to human health, risk managers have decided that these sites require no further action or regulatory oversight under the RCRA Subtitle C program. Therefore, these sites will not be addressed in the CMS.

However, some of these sites may require further action under the Navy's PST program or other applicable regulatory programs such as RCRA Subtitle I. The Navy PST program sites are classified as Category III sites and they will be listed later in this section.

In all, seven sites have been designated for NFA in Zone H. Each single site may consist of more than one investigated area (such as SWMU 138 and AOC 667):

Sites Designated for NFA	
AOC 654	Septic tank and drain field near Building 661
AOC 660	Site of the former mosquito control Building 31
AOC 661	Former explosives storage unit
AOC 665	Former explosives storage Building 159
SWMU 138 and AOC 667	Former hazardous material satellite accumulation area (SAA) and vehicle maintenance area near Building 1776
Other Impacted Area (OIA) G07 and G38	Polychlorinated biphenyls (PCB) contamination in the area of grid samples GDHSB007 and GDHSB038
OIA G80	Benzo(a)pyrene equivalents [BEQ] contamination in the borehole of NBCHGDH04D

4.3 Category II — CMS Sites

Sites designated for the CMS warrant a corrective measures study as directed by the project team. Figure 4.1, *Zone H CMS Sites,* shows the location of each CMS-designated site in Zone H.

In all, 20 investigated areas within Zone H have been designated for a CMS. However, a CMS-designated site may consist of more than one investigated area. As an example, SWMU 9 is considered a single CMS site even though it is composed of six other investigated sites (AOCs 649, 650, 651 and SWMUs 19, 20 and 121).

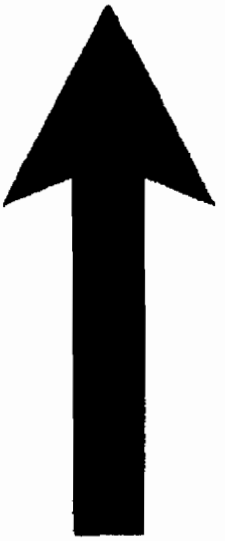
Sites Designated for CMS	
Combined SWMU 9 (includes AOCs 649, 650, and 651, and SWMUs 19, 20, and 121)	Closed landfill
AOCs 649, 650, and 651 (part of Combined SWMU 9)	Former storage area for ship painting and repair equipment
SWMU 19 (part of Combined SWMU 9)	Former solid waste transfer station
SWMU 20 (part of Combined SWMU 9)	Former mixed waste disposal area
SWMU 121 (part of Combined SWMU 9)	Former recycling material storage area and (SAA), Building 801
Combined SWMU 14 (includes AOCs 670 and 684 and SWMU 15)	Former chemical disposal area
AOC 670 (part of Combined SWMU 14)	Former skeet range near Building 1897
AOC 684 (part of Combined SWMU 14)	Former outdoor pistol range near Building 1888
SWMU 15 (part of Combined SWMU 14)	Former propane-fired incinerator
SWMU 17	Petroleum and PCB release area
SWMU 136 and AOC 663	Former SAA and diesel pumping station near Buildings NS53 and 851
SWMU 159	Former SAA near Building 665
AOC 503	Unexploded ordnance site south of Building 665
AOC 653	Former auto hobby shop, Building 1508
AOC 655	Former underground petroleum storage tank near former base exchange
AOC 656	Petroleum spill site near Building NS71 and aboveground storage tank (AST) 602
AOC 666	Petroleum underground storage tank (UST) site near Building NS45

4.4 Category III – PST Sites

PST-designated sites are those the project team identified as requiring additional studies or field work under the Navy's PST program or, if applicable, under the RCRA Subtitle I program for underground storage tanks. These sites do not require further action under Subtitle C (hazardous waste provision) of the RCRA CAP. Therefore, they have been eliminated from further RCRA Subtitle C corrective action requirements and will not be addressed in the CMS. Some of these sites may be candidates for transfer into the Subtitle I program.

In all, four sites have been designated as PST sites:

Sites Designated for PST Program	
AOC 659	Former diesel storage AST near Building 14
AOC 662	Site of a former gasoline station at Building NS54
SWMU 13	Fire fighter training area
SWMU 178	Site of apparent transformer fire outside of Building NS53



SECTION 5

5.0 SITE-SPECIFIC OVERVIEW

This section presents applicable background information for each CMS-designated site. The site-specific information includes:

- Site description
- Current use
- Future use
- Interim Stabilization Measures (ISM) Status
- Fate and transport summary
- Human health risk assessment summary and discussion of primary contaminants of concern (COCs)
- Ecological risk assessment summary
- Remedial objectives consistent with property reuse plans
- Potential remedial alternatives
- CMS data needs

Additional information, such as discussions about the landfill presumptive remedy and zone-wide ambient water quality, have also been included where necessary. The Zone H Final RFI Report should also be referenced for additional site-specific information which includes the following: field investigation methodology, physical setting, nature of contamination, fate and transport, baseline human health risk assessment, ecological risk assessment, and recommendations for CMS. It also provides conclusions, references, and supporting appendices.

Zone H RFI Summary

The objectives of the RFI were to characterize the nature and extent of contaminants associated with releases from SWMUs and AOCs, evaluate migration pathways, and identify both actual and potential receptors.

Zone H Groundwater Physical Setting and Ambient Water Quality

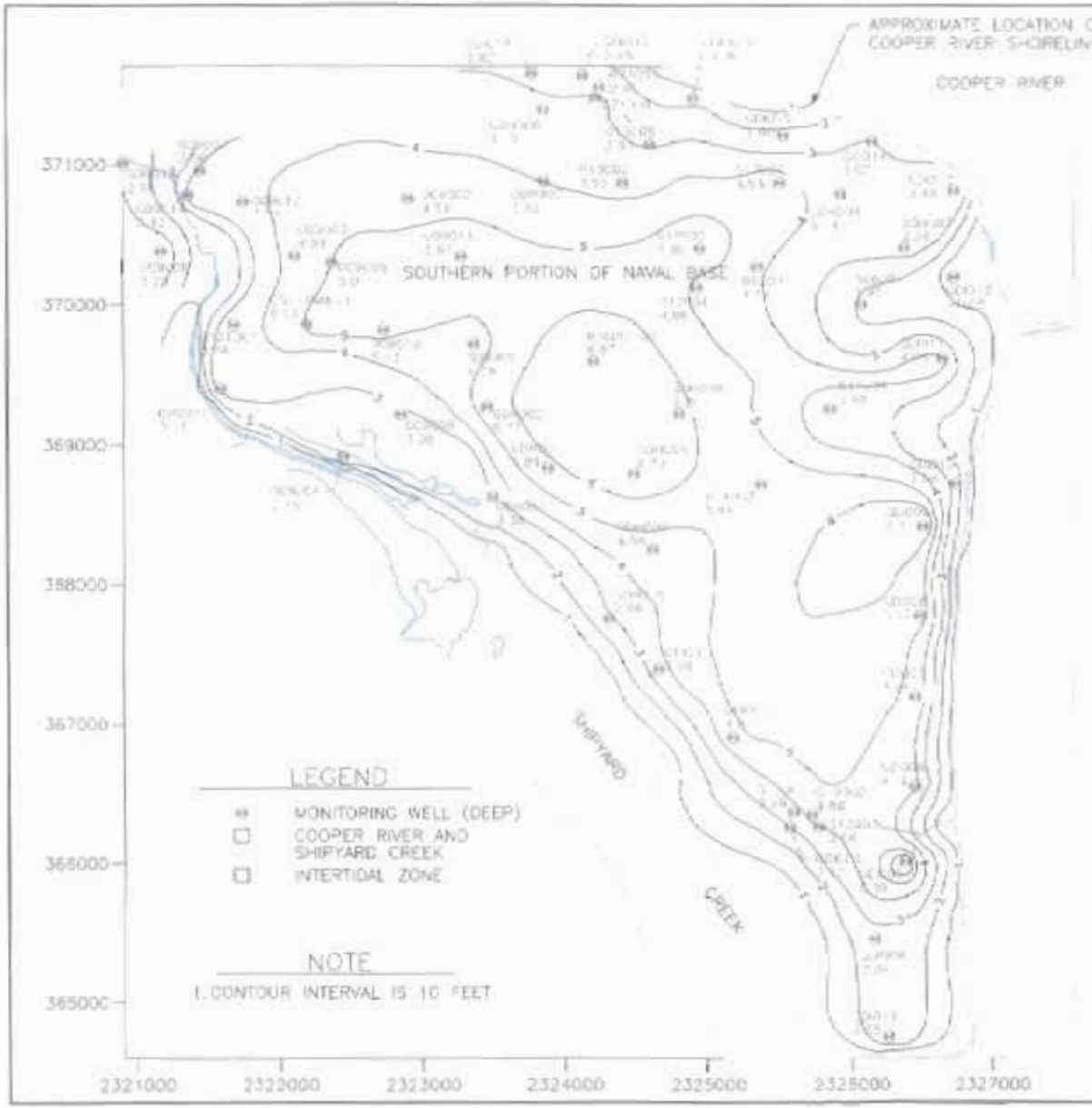
Physical Setting

Zone H groundwater can be divided into two separate sand aquifers - one shallow and one deep. Shallow and deep groundwater flow direction varies in different areas of the zone (Figures 5.A to 5.F), but flow velocities are generally slow, ranging from 0.0012 to 0.017 ft/day in the upper sand to 0.0019 to 0.029 ft/day in the lower sand. Low velocities can be attributed to the low horizontal conductivities (Figures 5.G) and low horizontal gradients (0.00041 to 0.006 in the upper sand) observed in Zone H. Vertical gradients (Figure 5.H) also varied across Zone H, rising in some areas and falling in others. A more detailed description of physical aquifer characteristics is in Section 3.2 of the Zone H RFI Report.

Ambient Water Quality

Both the Pleistocene deposits and the Santee Limestone function as potable aquifers in the Charleston region. However, the shallow (Pleistocene) aquifer is poorly developed in the former naval base area and therefore is not used. The South Carolina Water Resources Commission surveyed groundwater users within a seven-mile radius of the base to ascertain the extent of any shallow groundwater usage (*"The Groundwater Resources of Charleston, Berkeley, and Dorchester Counties, South Carolina. State of South Carolina Water Resources Commission Report, Number 139, A. Drennan Park, 1985."*). The survey identified no drinking water wells screened in the shallow aquifer within a four-mile radius of the base.

Analytical data for various parameters reflective of groundwater quality were obtained from 22 grid-based monitoring wells completed in the shallow aquifer's upper and lowers sands. These samples were collected during the first and second zone-wide groundwater sampling in the fall and winter of 1994 and the spring of 1995. Analytical results are summarized in Table 3.6, *Results of Groundwater Quality Analysis (in milligrams per liter(mg/L), except for pH)* of the Zone H RFI. Table 5.A summarizes the ambient water quality.



Coordinates X	Coordinates Y	Well	Top of Casing Elevation	Depth to Groundwater (5/11/95)	Groundwater Elevation
2322182	369859.1	CSI-PW-4	8.05	3.03	5.02
2321980	369368.0	009001	9.68	6.51	3.17
2322898	370759.8	009002	10.89	6.38	4.51
2322112	370341.8	009003	10.42	6.48	4.94
2322451	368019.5	009004	7.10	4.37	2.73
2323331	369705.6	009005	9.16	4.77	4.39
2321174	370378.8	009006	12.61	9.36	3.25
2321469	370945.9	009007	7.91	4.85	3.06
2322861	369251.5	009008	8.44	5.36	3.08
2322353	370304.8	009009	14.27	9.26	5.01
2322720	369618.8	009010	11.25	6.12	5.13
2323258	370342.3	009011	13.77	8.10	5.67
2321753	370727.7	009012	9.62	6.05	3.57
2321358	370766.1	009014	8.84	5.72	3.12
2320801	371010.5	009015	10.72	7.77	2.95
2324390	370867.3	013002	9.12	5.57	3.55
2324579	371139.1	013005	11.47	8.54	2.93
2325378	368702.3	014000	17.33	7.79	9.44
2325851	369243.3	014004	9.72	6.24	3.48
2324931	370369.3	017002	10.47	4.82	5.65
2324907	370122.1	017004	9.80	4.84	4.96
2321674	369851.8	121001	9.15	5.41	3.74
2325481	370865.9	178001	12.23	7.70	4.53
2324188	369585.2	656001	11.23	4.36	6.87
2325329	370271.2	662001	8.62	4.51	4.11
2326044	370000.4	666001	10.59	8.69	1.90
2323892	368830.3	GDH001	13.01	7.12	5.89
2323451	369253.4	GDH002	9.82	4.05	5.77
2323850	370885.1	GDH003	13.20	9.28	3.92
2325925	370792.6	GDH004	11.43	8.29	3.14
2324492	368776.0	GDH005	14.73	8.03	6.70
2323874	371402.2	GDH006	7.59	4.44	3.15
2326380	370412.3	GDH007	10.22	6.84	3.38
2324798	369229.0	GDH008	12.94	6.74	6.20
2324656	368258.4	GDH009	13.78	8.20	4.58
2324284	367779.6	GDH010	9.26	6.30	2.96
2323490	368617.6	GDH011	9.60	6.22	3.38
2325584	368357.8	GI2001	8.14	4.65	3.49
2325709	368344.0	GI2002	9.08	4.22	4.86
2325755	368354.8	GI2003	8.45	4.79	3.66
2324229	371547.5	671003	8.76	5.86	2.90
2324200	371468.5	671004	8.85	5.70	3.15
2324651	367398.1	GDI00	8.73	4.75	3.98
2325178	368908.0	GDI002	11.76	6.54	4.92
2325570	368259.5	GDI003	9.05	5.92	3.13
2326156	365451.3	GDI004	8.65	5.81	2.84
2326363	365995.3	GDI005	9.98	3.59	6.39
2326454	366555.0	GDI006	7.74	3.63	4.11
2326455	367181.4	GDI007	13.31	5.67	4.64
2326462	367772.1	GDI008	11.48	6.31	5.17
2326505	368418.0	GDI009	11.29	4.58	6.71
2326745	368728.6	GDI010	8.03	5.39	2.64
2326636	369618.2	GDI011	8.79	4.73	4.06
2326722	370205.1	GDI012	11.01	11.06	-0.05
2326723	370828.2	GDI013	11.90	8.41	3.49
2326133	371186.9	GDI014	8.75	5.73	3.02
2325833	371205.4	GDI015	11.12	8.52	2.60
2324905	371480.0	GDI016	6.02	4.12	1.88
2324116	371633.4	GDI017	10.25	7.80	2.45
2323773	371635.9	GDI018	7.15	4.33	2.82
2326256	364744.5	GDI019	8.79	6.24	2.55

800 0 800
SCALE FEET

ZONE II
CMS WORK PLAN
NAVAL BASE CHARLESTON
CHARLESTON, S.C.

FIGURE 5.A
SHALLOW GROUNDWATER PIEZOMETRIC SURFACE - MAY 11, 1995

DWG. DATE: 04/07/95 | DWG. NAME: 29058002

CMS WORK PLAN

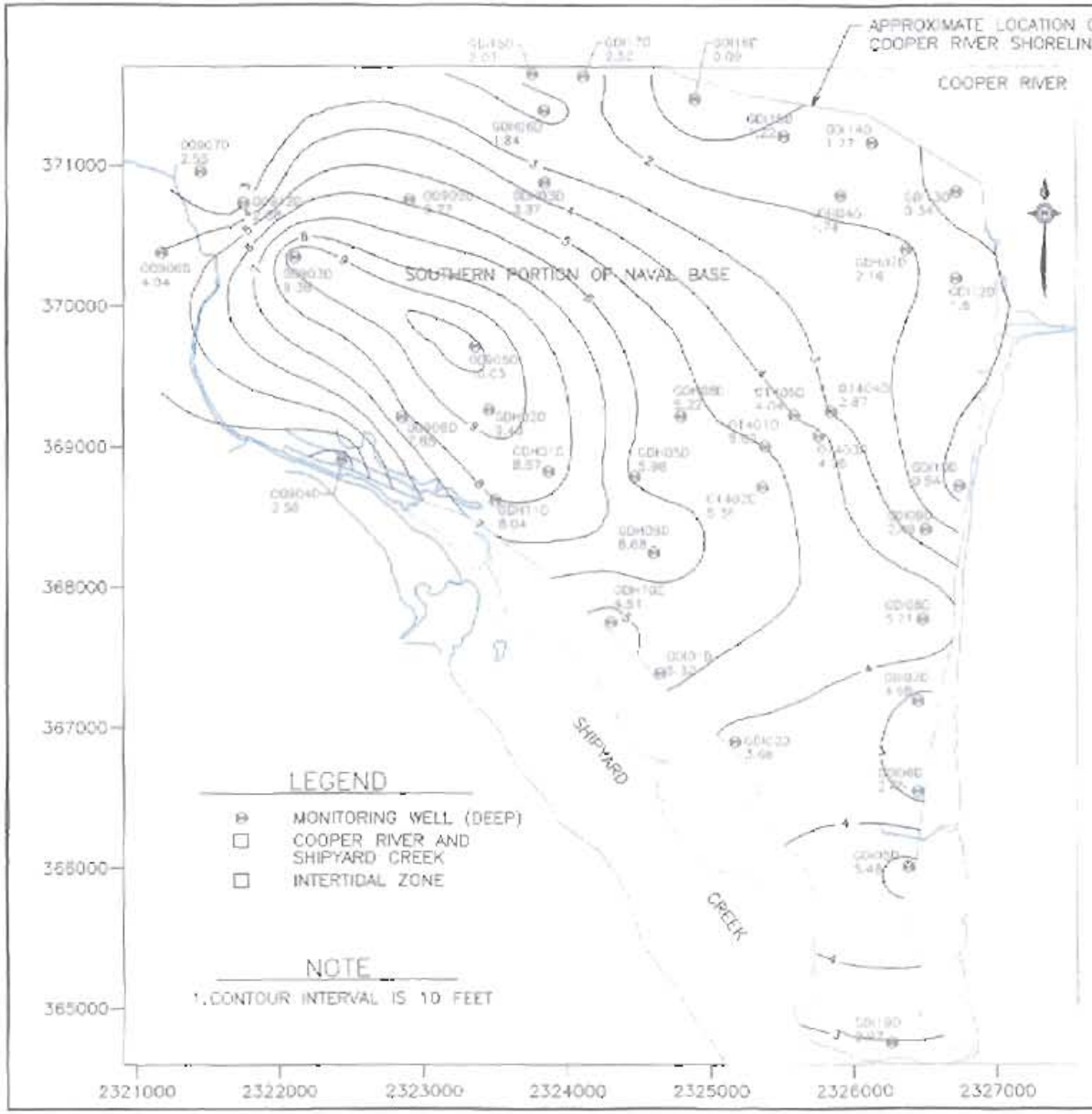
Charleston Naval Base
Zone H
CHARLESTON, S.C.

Figure 5.B
Shallow Groundwater
Piezometric Surface
January 20, 1998

CMS WORK PLAN

Charleston Naval Base
Zone H
CHARLESTON, S.C.

Figure 5.C
Shallow Groundwater
Piezometric Surface
January 21, 1998



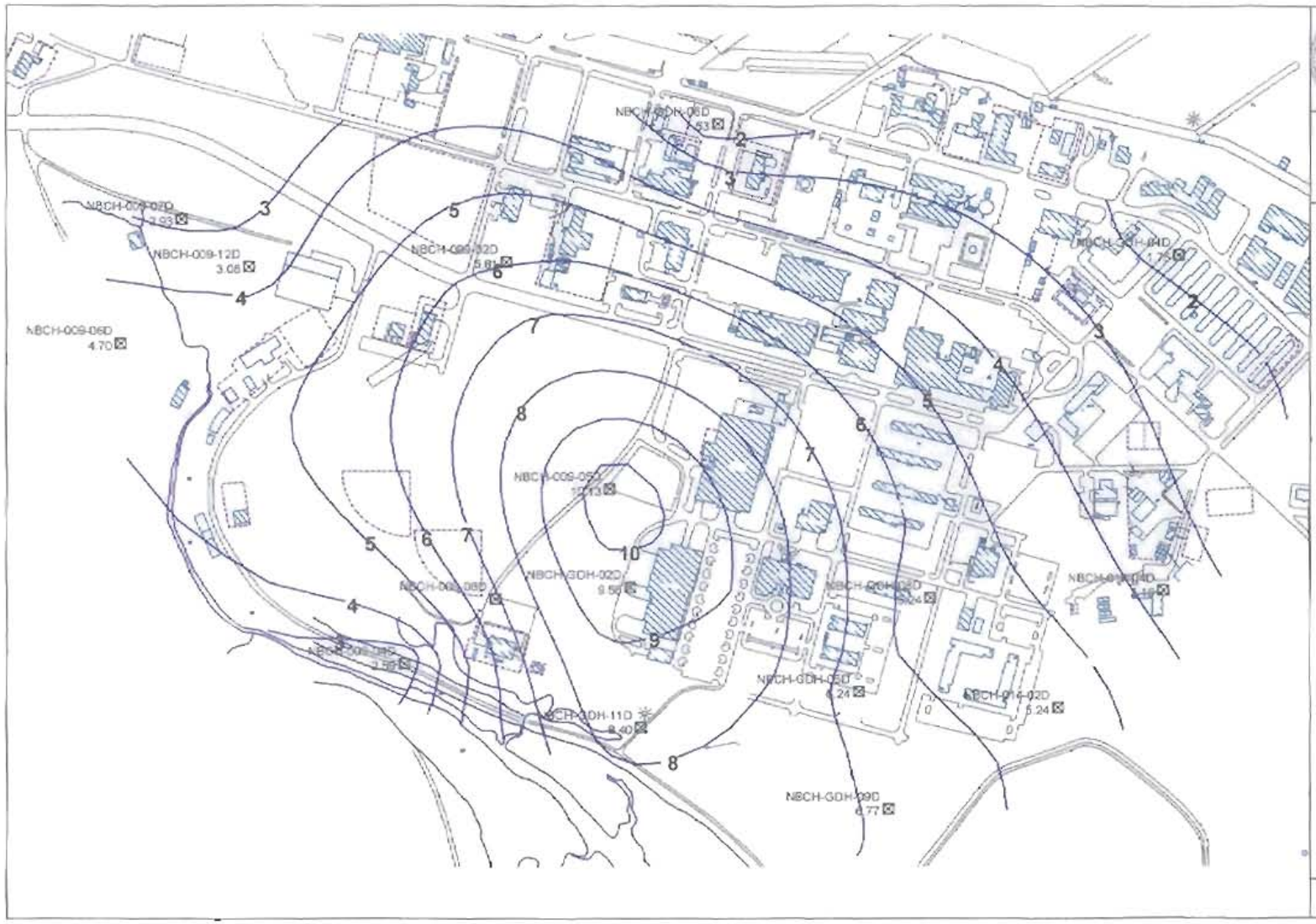
Coordinates X	Coordinates Y	Well	Top of casing Elevations	Depth to Groundwater	Groundwater Elevations
2322898	370759.8	009020	10.80	5.03	5.77
2322112	370341.4	009030	9.88	0.5	9.38
2322451	368919.5	009040	7.19	4.61	2.58
2323331	369705.6	009050	10.83	0.8	10.03
2321174	370378.8	009060	13.20	9.16	4.04
2321459	370945.9	009070	7.73	5.18	2.55
2322861	369251.5	009080	7.85	0.00	7.85
2321753	370727.7	009120	9.42	6.54	2.88
2325395	369001.7	014010	12.58	7.56	5.02
2325376	368713.4	014020	12.87	7.51	5.36
2325767	369076.1	014030	11.24	6.98	4.26
2325851	369251.7	014040	9.38	6.51	2.87
2325602	369226.0	014050	11.65	7.61	4.04
2323892	368830.3	GDH01D	13.06	4.49	8.57
2323451	369263.4	GDH02D	9.83	0.4	9.43
2323850	370885.1	GDH03D	12.85	9.48	3.37
2325925	370792.6	GDH04D	11.72	9.98	1.74
2324482	368776.0	GDH05D	14.35	8.37	5.98
2323874	371402.2	GDH06D	7.70	5.86	1.84
2326380	370412.3	GDH07D	11.85	9.69	2.16
2324798	369229.0	GDH08D	13.10	7.88	5.22
2324656	368258.4	GDH09D	13.29	6.61	6.68
2324284	367779.6	GDH10D	9.59	5.08	4.51
2323490	368617.6	GDH11D	9.55	1.51	8.04
2324651	367396.1	GDI01D	8.78	3.46	5.32
2325176	366908.0	GDI02D	11.88	8.20	3.68
2326383	365995.3	GDI05D	6.67	1.21	5.46
2326454	366555.0	GDI06D	7.45	4.85	2.60
2326465	367181.4	GDI07D	10.49	7.81	2.68
2326482	367772.1	GDI08D	11.42	6.21	5.21
2326505	368418.0	GDI09D	11.36	8.87	2.49
2326745	368728.6	GDI10D	8.00	7.46	0.54
2326722	370205.1	GDI12D	10.86	9.21	1.65
2326723	370825.2	GDI13D	11.84	11.50	0.34
2326133	371166.9	GDI14D	8.58	6.81	1.77
2325533	371205.4	GDI15D	10.83	9.61	1.22
2324905	371480.0	GDI16D	6.00	5.91	0.09
2324116	371633.4	GDI17D	10.26	7.74	2.52
2323773	371635.9	GDI18D	7.11	5.08	2.03
2326255	364744.5	GDI19D	9.13	6.16	2.97

800 0 800
SCALE FEET

ZONE H
CMS WORK PLAN
NAVAL BASE CHARLESTON
CHARLESTON, S.C.

FIGURE 5.D
DEEP GROUNDWATER PIEZOMETRIC SURFACE – MAY 11, 1995

DWG DATE 04/07/98 | DWG NAME 29085001



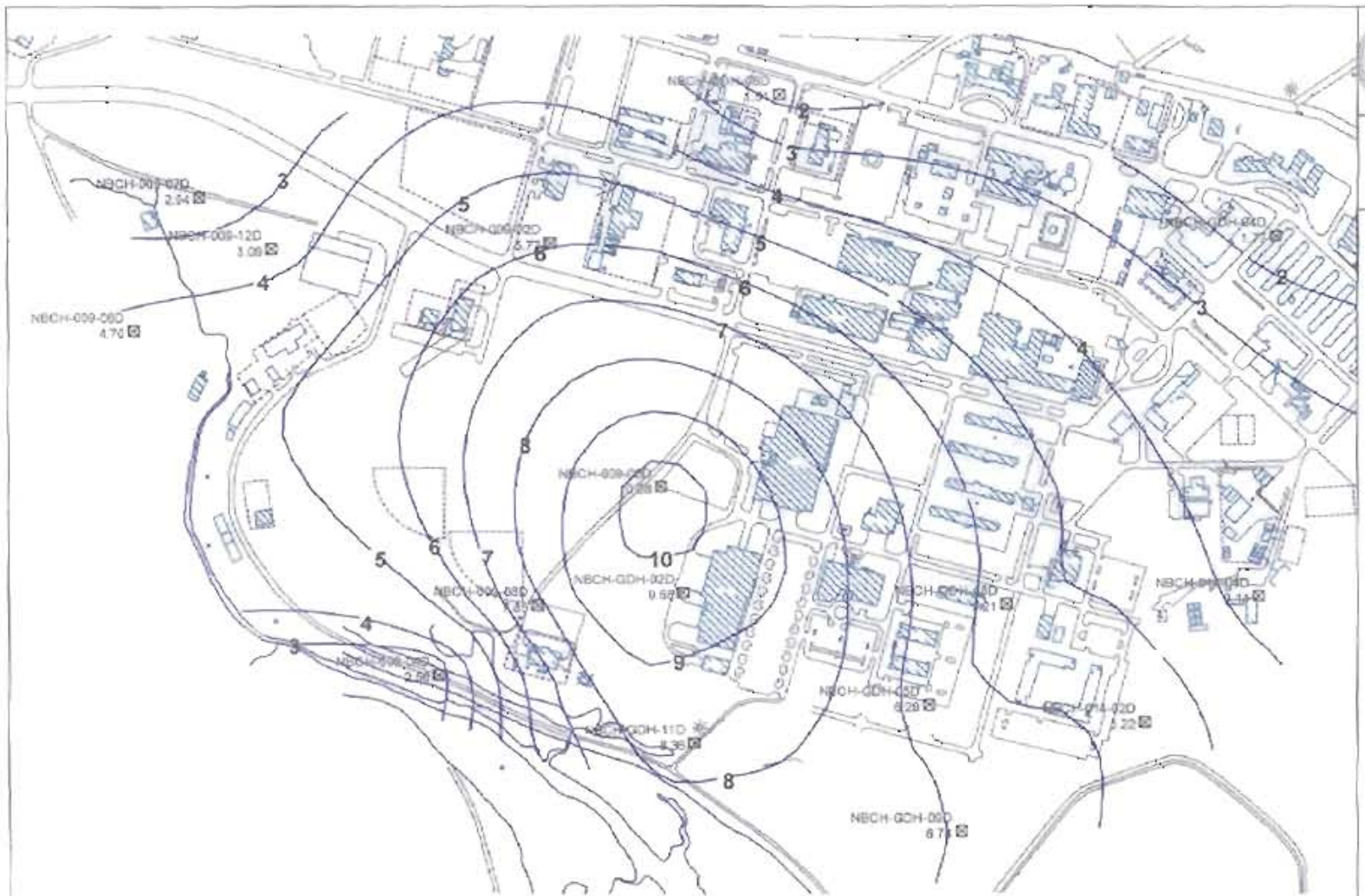
CMS WORK PLAN
Charleston Naval Base
Zone H
CHARLESTON, S.C.

Figure 5.E
Deep Groundwater
Piezometric Surface
January 20, 1998

Groundwater Elevations 1/20/98
- Groundwater Elevation (feet msl)
- Annotation
- Deep Groundwater Wells
- Water
- Pier
- Road
- Bldg
- Fence

N
W E
S

1:500



CMS WORK PLAN
Charleston Naval Base
Zone H
CHARLESTON, S.C.

Figure 5.F
Deep Groundwater
Piezometric Surface
January 21, 1998

Groundwater Elevations 1/21/98
- Groundwater Elevation (feet msl)
- Annotation
- Deep Groundwater Wells
- Water
- Pier
- Road
- Bldg
- Fence

N
W
E
S

1:500

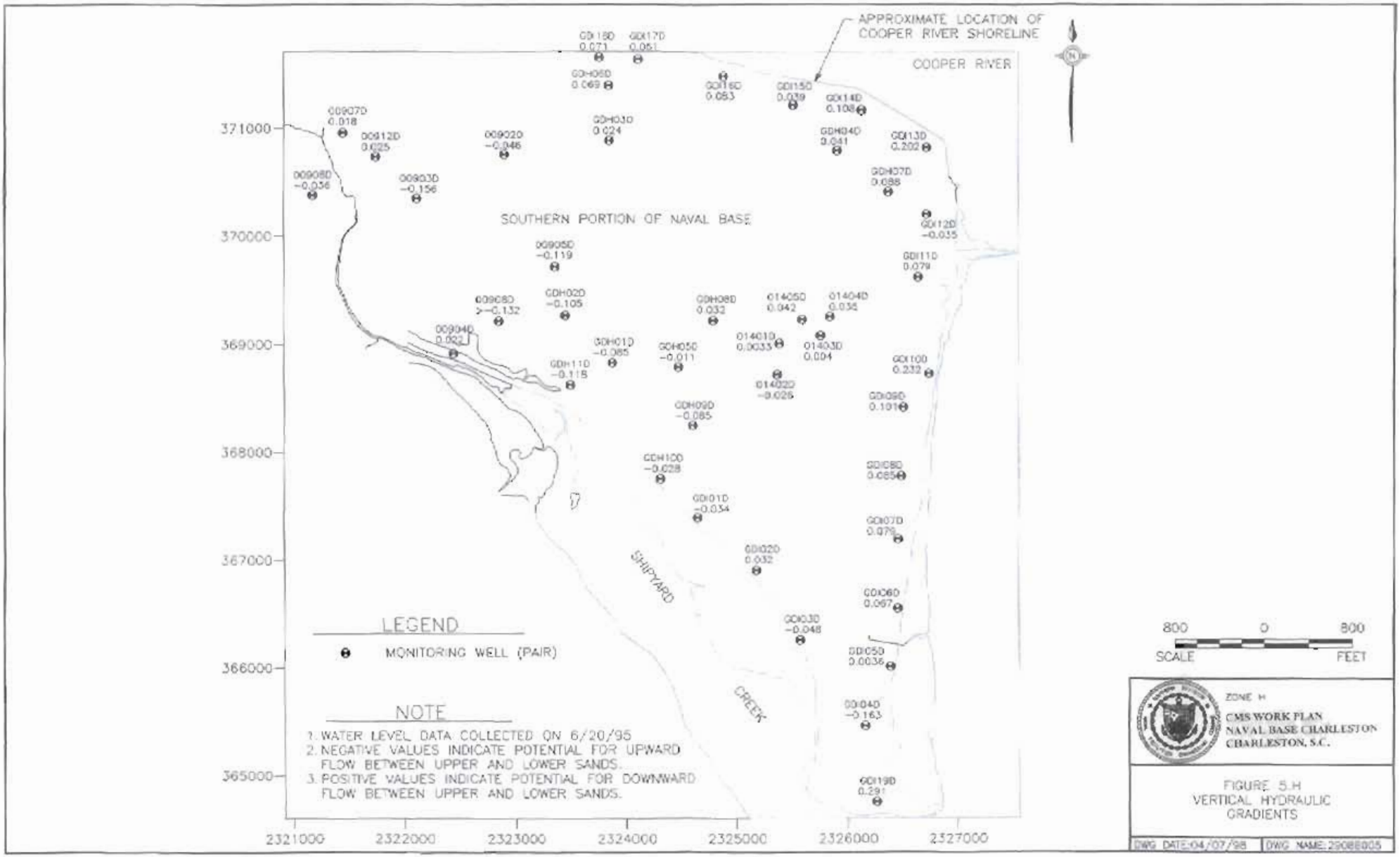

APPROXIMATE LOCATION OF COOPER RIVER SHORELINE
COOPER RIVER
SOUTHERN PORTION OF NAVAL BASE
SHIPYARD
CREEK
GDI18D 0.071
GDI17D 0.051
GDH05D 0.069
GDI16D 0.083
GDI15D 0.039
GDI14D 0.108
GDH04D 0.041
GDI13D 0.202
GDH07D 0.088
GDI12D -0.035
GDI11D 0.079
GDH02D -0.105
GDH08D 0.032
14405D 0.042
14404D 0.035
14401D 0.0033
14403D 0.004
14402D -0.025
GDI10D 0.232
GDH09D 0.101
GDH10D -0.028
GDI08D 0.065
GDI01D -0.034
GDI07D 0.079
GDI02D 0.032
GDI06D 0.097
GDI03D -0.048
GDI05D 0.0036
GDI04D -0.163
GDI19D 0.291
009007D 0.018
009012D 0.025
009020 -0.046
GDH03D 0.024
009008D -0.036
009003D -0.156
009005D -0.119
009006D -0.132
009004D 0.022
GDH01D -0.085
GDH05D -0.011
GDH11D -0.115
371000
370000
369000
368000
367000
366000
365000
2321000
2322000
2323000
2324000
2325000
2326000
2327000
LEGEND
MONITORING WELL (PAIR)
NOTE
1. WATER LEVEL DATA COLLECTED ON 6/20/95
2. NEGATIVE VALUES INDICATE POTENTIAL FOR UPWARD FLOW BETWEEN UPPER AND LOWER SANDS.
3. POSITIVE VALUES INDICATE POTENTIAL FOR DOWNWARD FLOW BETWEEN UPPER AND LOWER SANDS.
800 0 800
SCALE FEET
ZONE H
CMS WORK PLAN
NAVAL BASE CHARLESTON
CHARLESTON, S.C.
FIGURE 5.H
VERTICAL HYDRAULIC GRADIENTS
DWG DATE:04/07/98
DWG NAME: 2908E005

Table 5.A
Zone H Ambient Water Quality
(units of mg/L except pH)

Water Quality Parameter	1st Qtr. range (mean)	2nd Qtr. range (mean)	SCDHEC Class GB Standards		USEPA SMCLs	
			standard	exceeded	standard	exceeded
pH	6.84 to 7.69 (NA)	ND (ND)	NL	—	6.5 to 8.5	No
TDS	260 to 32,000 (15,200)	280 to 27,000 (15,600)	10,000	YES	500	YES
Chloride	14 to 21,000 (6,500)	21 to 20,000 (8,000)	NL	—	250	YES
Sulfate	23 to 1,700 (450)	10 to 1,900 (390)	NL	—	250	YES

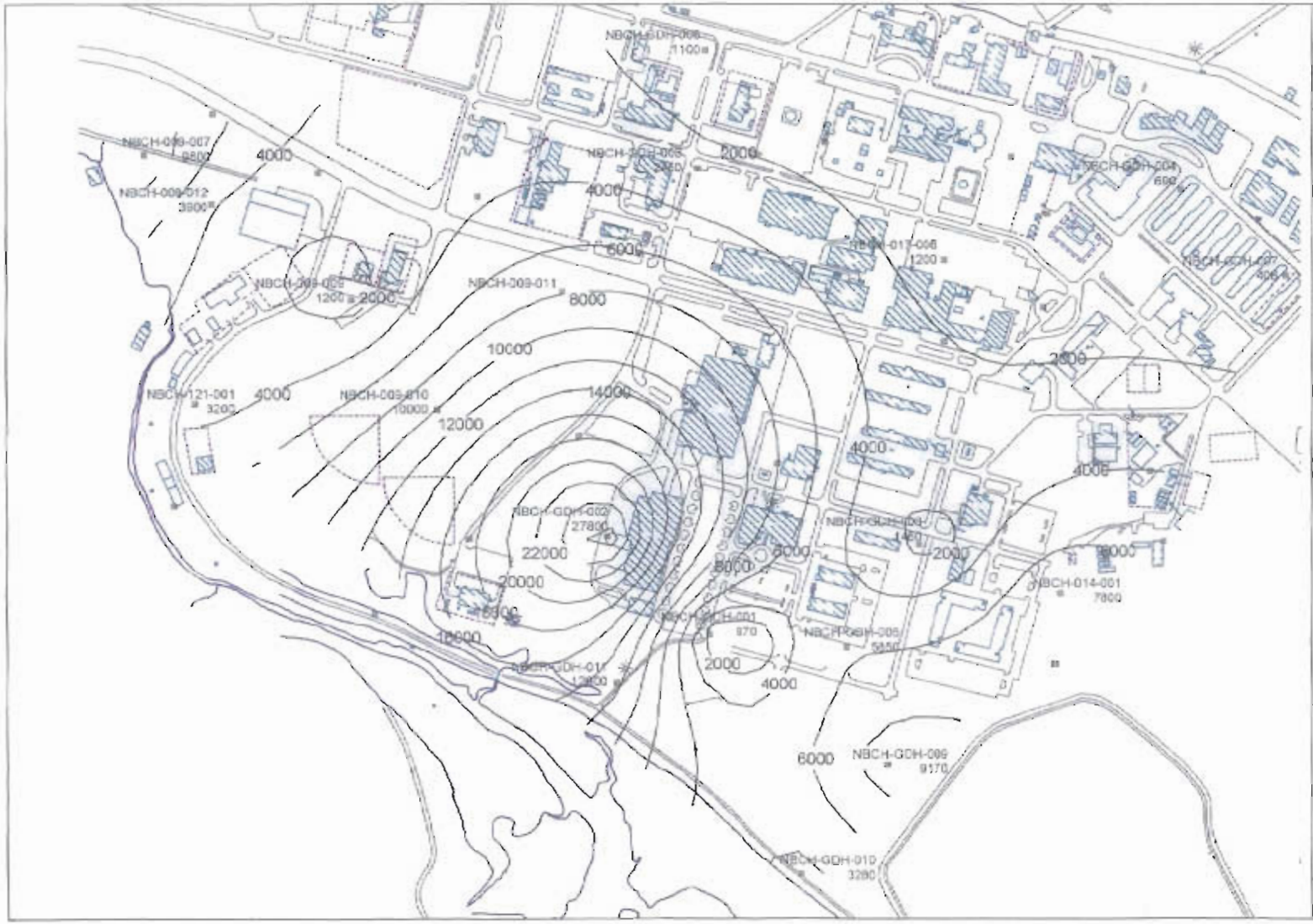
Notes:

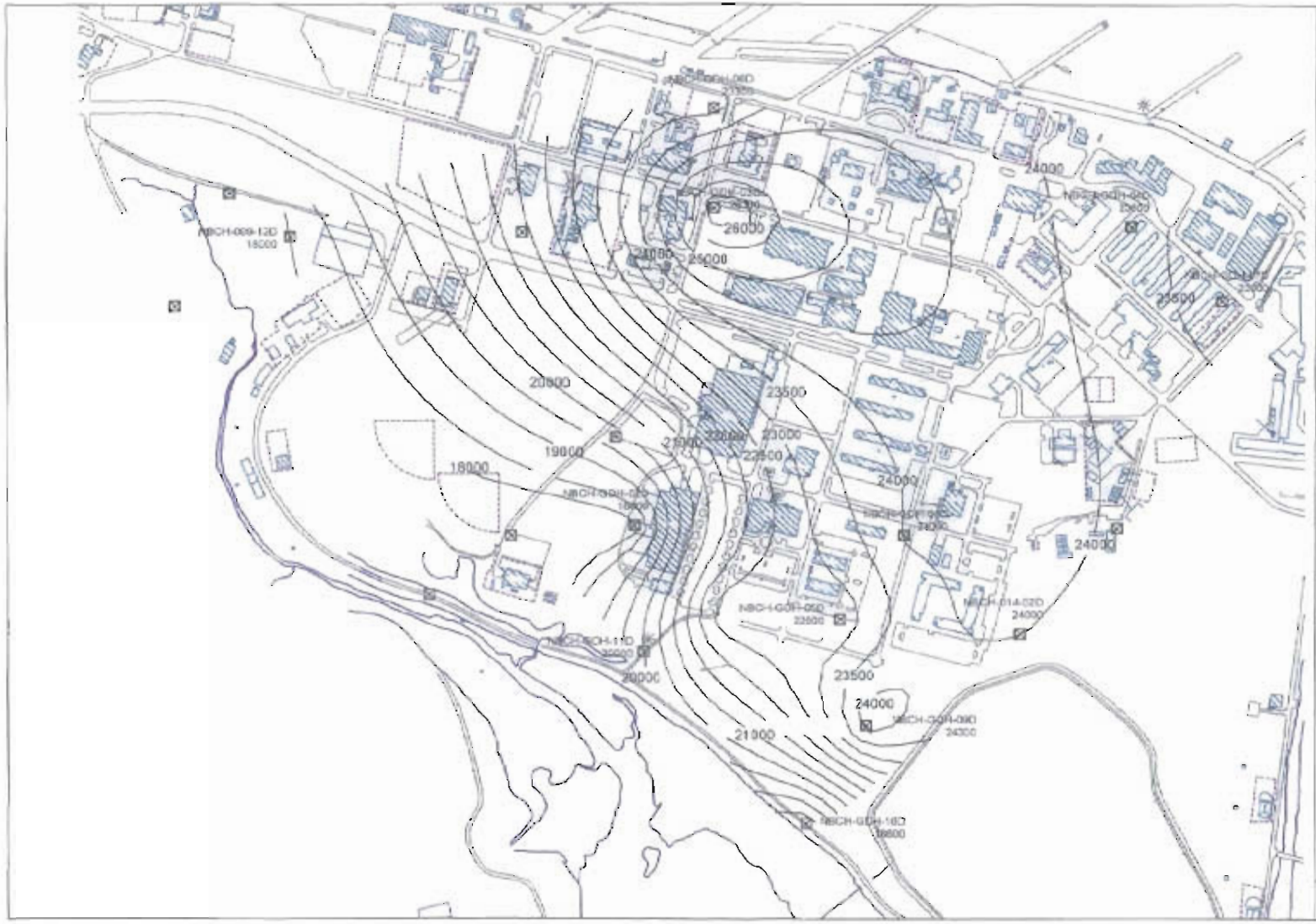
SCDHEC	South Carolina Department of Health and Environmental Control
GB Standards	Potable water quality standards per SCDHEC
USEPA	United States Environmental Protection Agency
SMCLs	Secondary Maximum Contaminant Levels for drinking water per USEPA
NA	Not applicable
ND	Not determined
NL	Not listed
TDS	Total dissolved solids

TDS

The upper limit of freshwater TDS is approximately 1,500 mg/L. Brackish waters have an upper limit of approximately 5,000 mg/L, while waters containing higher TDS concentrations are considered saline. Seawater typically ranges from 30,000 to 34,000 mg/L. Typical domestic U.S. wastewater contains TDS concentrations of approximately 500 mg/L. The TDS shallow and deep contour maps (Figure 5.I and 5.J) show concentrations exceed salinity criteria over much of the zone.

Reference material for the presented TDS, chloride, and sulfate parameters was obtained from *Wastewater Engineering, Treatment, Disposal, and Reuse,* Metcalf and Eddy, Inc., 3rd Edition,


NBCH-GDH-006
1100
NBCH-009-007
8800
NBCH-009-012
3900
NBCH-009-005
1200
NBCH-009-011
NBCH-121-001
3200
NBCH-009-010
10000
NBCH-GDH-002
27800
NBCH-GDH-001
870
NBCH-GDH-01
12900
NBCH-GDH-004
690
NBCH-017-006
1200
NBCH-GDH-007
NBCH-GDH-003
1400
NBCH-014-001
7800
NBCH-GDH-005
5150
NBCH-GDH-009
9170
NBCH-GDH-010
3290
4000
2000
6000
8000
10000
14000
12000
22000
20000
16000
18000
CMS WORK PLAN
Charleston Naval Base
Zone H
CHARLESTON, S.C.
Figure 5.1
TDS in Shallow Groundwater
TDS in Shallow Groundwater
Total Observed Solids (mg/L) in Shallow Groundwater
Shallow Groundwater Wells
Water
Pier
Road
Bldg
Fence
N
W
E
S
1:500



CMS WORK PLAN
Charleston Naval Base
Zone H
CHARLESTON, S.C.

Figure 5.J
TDS in Deep Groundwater

TDS in Deep Groundwater
Total Dissolved Solids (mg/L) in Deep Groundwater
Deep Groundwater Wells
Water
Pier
Road
Bldg
Fence

N
W
E
S

1:500

Tchobanoglous and Burton, McGraw-Hill, Inc., 1991; and *Water Quality, Characteristics, Modeling, and Modification,* Tchobanoglous and Schroeder, Addison Wesley,1987.

Chloride

The chloride concentrations in domestic U.S. drinking water supplies typically range from 5 to 100 mg/L, with the higher end of the range in coastal communities. Chloride concentrations in typical surface water supplies are approximately 50 mg/L and domestic U.S. wastewater will have chloride concentrations exceeding 100 mg/L versus a USEPA drinking water standard of 250 mg/L. Chloride concentrations (Figure 5.K and 5.L) range up to 9700 mg/L and fall below 250 mg/L at only one point (NBCH-009-006, 97.6 mg/L) in the shallow aquifer.

Sulfates

The sulfate concentrations in domestic U.S. drinking water supplies typically range from 10 to 300 mg/L. In addition, high concentrations of sulfate in wastewater directly affect wastewater sludge treatability. Therefore, the cost and resources needed to treat and handle sludge dramatically increase. Figure 5.M and 5.N shows the SWMU 9 sulfate in groundwater contours.

Groundwater Development

Based on the mean values of the four ambient water quality parameters, groundwater at SWMU 9 would be difficult to treat from ambient conditions to a level where it could meet state or federal drinking water standards. The high cost, low benefit, and technical impracticability of developing SWMU 9 groundwater as a potable water resource would likely prohibit such development. Therefore, remedial goals for Zone H groundwater will focus on potential target receptors, primarily ecological concerns associated with offsite migration into Shipyard Creek.

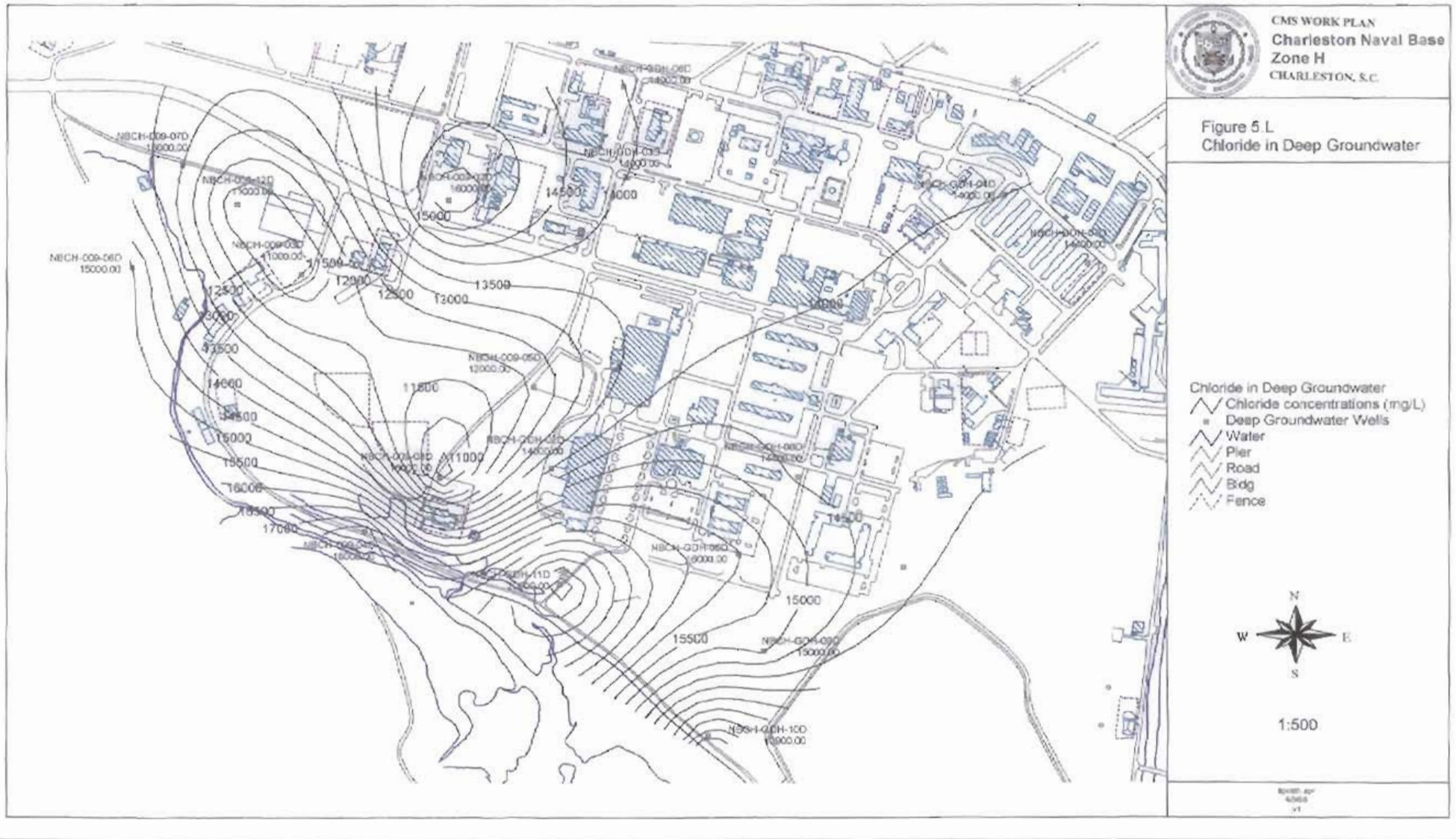
CMS WORK PLAN
Charleston Naval Base
Zone H
CHARLESTON, S.C.

Figure 5.K
Chloride in Shallow Groundwater

Chloride in Shallow Groundwater
- Chloride Concentrations (mg/L)
- Shallow Groundwater Wells
- Water
- Road
- Bldg
- Fence

N
W
E
S

1:500


CMS WORK PLAN
Charleston Naval Base
Zone H
CHARLESTON, S.C.
Figure 5.L
Chloride in Deep Groundwater
Chloride in Deep Groundwater
Chloride concentrations (mg/L)
Deep Groundwater Wells
Water
Pier
Road
Bldg
Fence
N
W
E
S
1:500

CMS WORK PLAN
Charleston Naval Base
Zone H
CHARLESTON, S.C.

Figure 5.M
Sulfate Shallow Groundwater

Sulfate in Shallow Groundwater
- Sulfate Concentrations (mg/L)
- Shallow Groundwater Wells
- Water
- Pier
- Road
- Bldg
- Fence

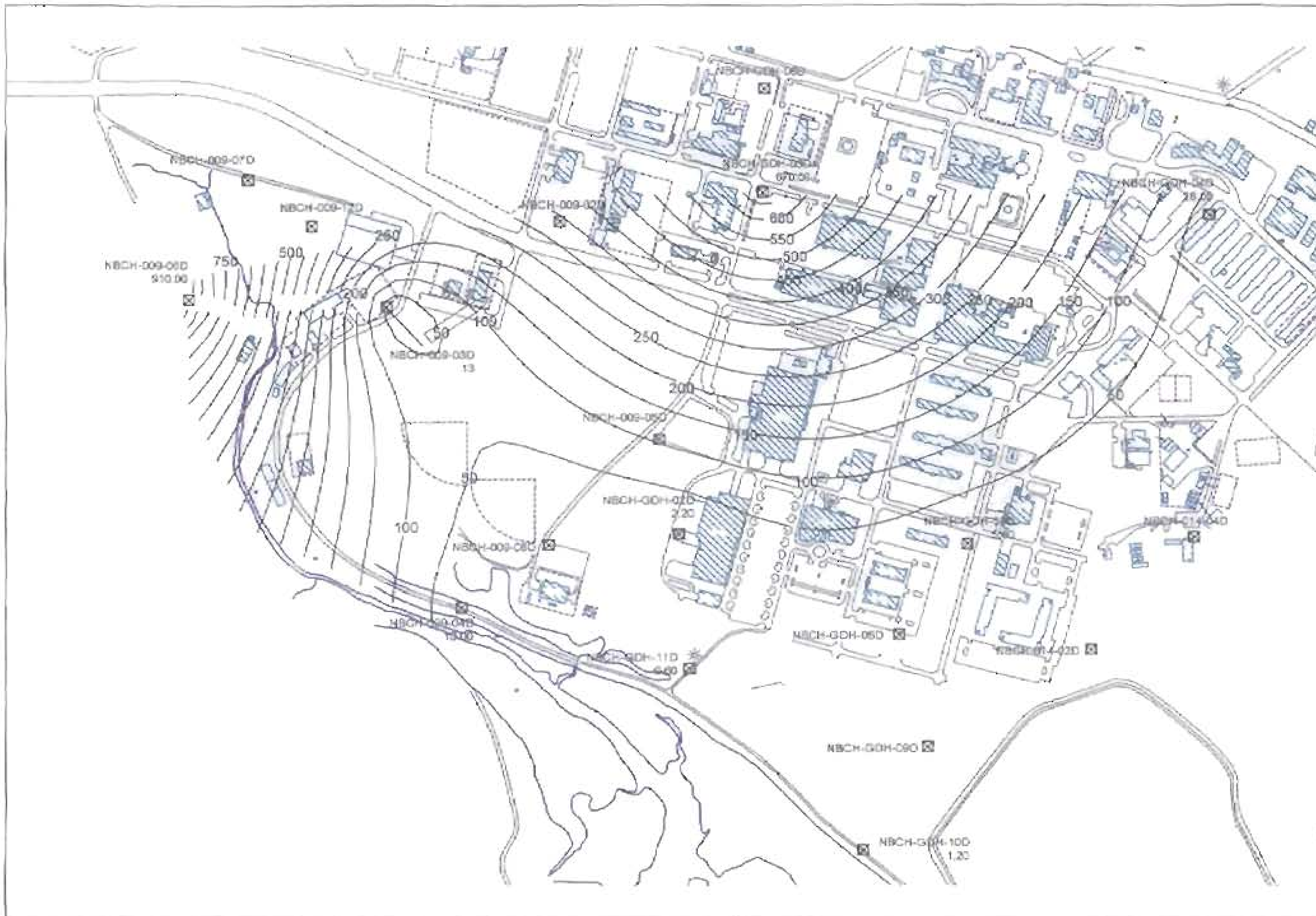
N
W
E
S

1:525

CMS WORK PLAN

Charleston Naval Base
Zone H
CHARLESTON, S.C.

Figure 5.N
Sulfate in Deep Groundwater



⊠ Deep Monitoring Wells
Sulfate in Deep Groundwater
Sulfate Concentrations (mg/L)
Water
Pier
Road
Bldg
Fence

N
W E
S

1:501

Zone H Contaminants of Concern (COCs)

Soil

Contaminants of concern in soil were selected based primarily on their contribution to surface soil risk and hazard. Figures 5.O through 5.S show the zone-wide distribution of the primary Zone H COCs for soil - *Arsenic, Beryllium, B(a)P Equivalents (BEQs), Aroclor-1254, and Aroclor-1260.* Figures 5.T and 5.U present zone-wide human health risk above background posed by surface soil.

Groundwater

COCs in groundwater were selected based primarily on their presence in concentrations above MCLs through multiple rounds of sampling. Contaminants which appeared over a zone-wide area are contoured on Figures 5.V to 5.X (Chlorobenzene, Dichlorobenzene and Trichlorothene).

CMS WORK PLAN

Charleston Naval Base
Zone H
CHARLESTON, S.C.

Figure 5.T
Surface Soil Risk Above Background
Residential

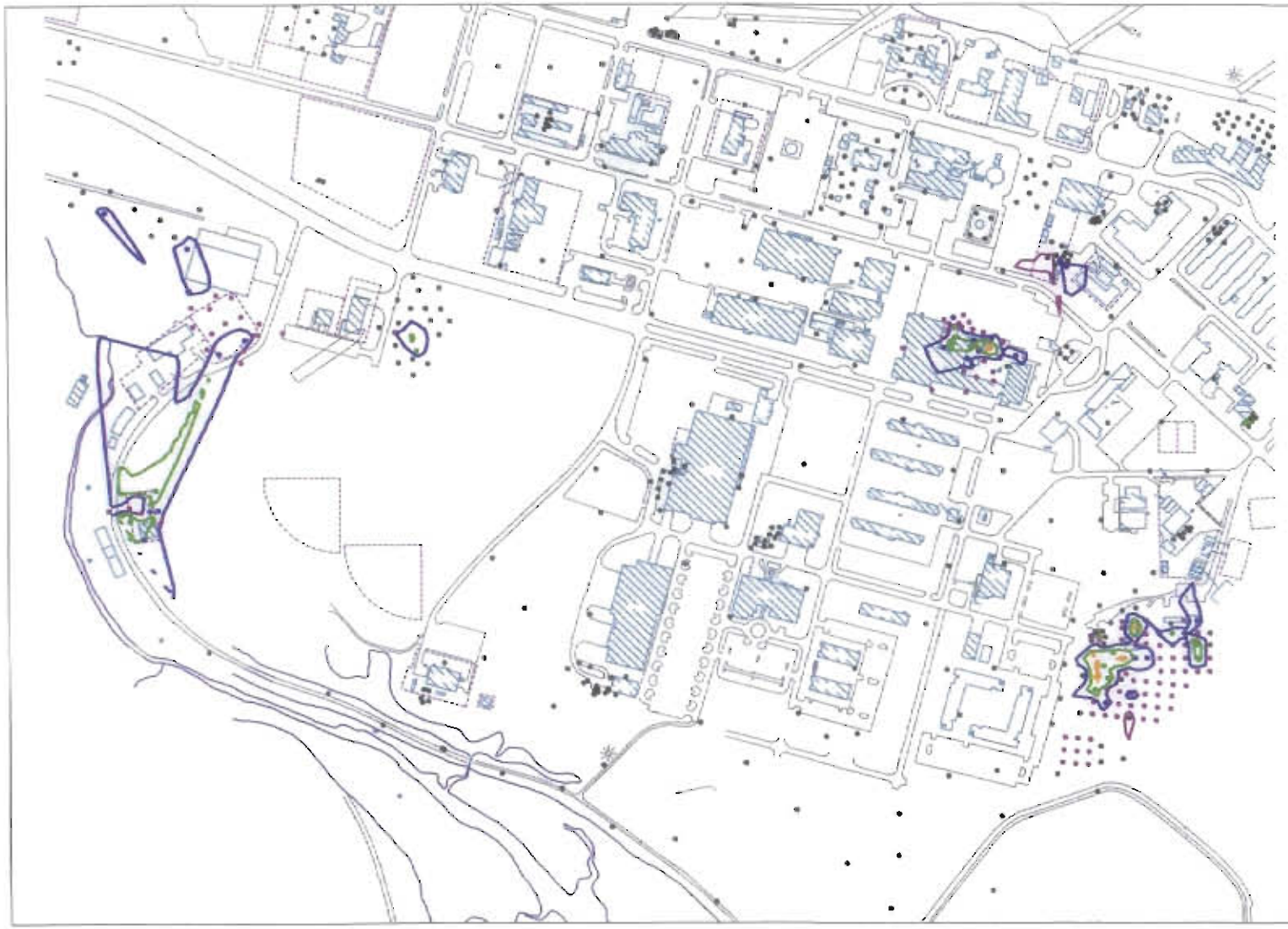
Legend
- Residential Risk > 1E-4
- Residential Risk between 1E-5 and 1E-6
- Residential Risk between 1E-6 and 1E-7
- Residential Risk below background level**
- Residential Risk between 1E-4 and 1E-5
- Residential Risk < 1E-7

**or sample was non-detect for risk drivers

- Water
- Pier
- Road
- Bldg
- Fence

N
W
E
S

1:500



CMS WORK PLAN
Charleston Naval Base
Zone H
CHARLESTON, S.C.

Figure 5.U
Surface Soil Risk Above Background
Industrial

Legend
- Industrial Risk > 1E-4
- Industrial Risk between 1E-5 and 1E-6
- Industrial Risk between 1E-6 and 1E-7
- Industrial Risk below background**
- Industrial Risk between 1E-4 and 1E-5
- Industrial Risk < 1E-7

**or sample was non-detect for risk drivers

- Water
- Pier
- Road
- Bldg
- Fence

N
W
E
S

1:400

CMS WORK PLAN
Charleston Naval Base
Zone H
CHARLESTON, S.C.

Figure 5.V
Chlorobenzene
in Shallow Groundwater

Legend
Chlorobenzene concentrations > 1000 mg/L
Chlorobenzene concentrations 100 to 1000 mg/L
Chlorobenzene concentrations 10 to 100 mg/L
Chlorobenzene not detected
Chlorobenzene sample point below MCL (100 mg/L)
Shallow Groundwater Wells
Water
Pier
Road
Bldg
Fence

N
W
E
S

1:480

CMS WORK PLAN

Charleston Naval Base
Zone H
CHARLESTON, S.C.

Figure 5.W
Dichlorobenzene
in Shallow Groundwater

Legend
Dichlorobenzene concentrations > 1000 ng/L
Dichlorobenzene concentrations 100 to 1000 ng/L
Dichlorobenzene concentrations 10 to 100 ng/L
Dichlorobenzene not detected
Dichlorobenzene sample point below MCL (75 ng/L)
Shallow Groundwater Wells
Water
Pier
Road
Bldg
Fence

N
W
E
S

1:550

CMS WORK PLAN

Charleston Naval Base
Zone H
CHARLESTON, S.C.

Figure 5.X
Trichloroethene
in Shallow Groundwater

Legend
Trichloroethene concentrations > 10 mg/L
Trichloroethene not detected
Trichloroethene sample point below MCL (5 mg/L)
Shallow Groundwater Wells
Water
Pier
Road
Bldg
Fence

N
W
E
S

1:500

5.1 Combined SWMU 9 (Includes AOCs 649, 650, and 651, and SWMUs 19, 20, and 121)

Combined SWMU 9, a closed landfill at the base's southern end, is generally bounded by Shipyard Creek to the southwest, Bainbridge Avenue to the northeast, and Holland Street to the southeast.

Waste Classification

The landfill was used for industrial and domestic solid waste disposal from the 1930s until the early 1970s. Though Combined SWMU 9 was a military-use landfill, it can be considered a municipal-type landfill because it contains municipal-type and low-hazard military-specific wastes. In accordance with the United States Environmental Protection Agency (USEPA) guidance regarding presumptive remedies for landfills, this particular landfill is considered a low-level risk because it contains primarily municipal-type wastes.

RFI trenching activities unearthed materials such as medical waste, empty oil containers, empty Freon tanks, cargo netting, gas masks, concrete, wood, and domestic garbage. Except for gas masks and medical waste, these landfilled materials are essentially what is expected at municipal-type landfills.

Additional Sites at the Landfill

Seven additional sites were investigated concurrently with SWMU 9 (thus the term Combined SWMU 9) during the RFI because they were within the landfill's estimated perimeter. These sites included SWMU 19, a former solid waste transfer station; SWMU 20, a former waste disposal area that appears to have been used for disposal of industrial-type materials; SWMU 121, a former satellite accumulation area associated with a recycling operation; AOCs 649, 650, and 651, areas formerly used to store ship repair supplies; and AOC 654, the location of a former septic tank disposal system. The project team has eliminated AOC 654 from further CMS considerations.

Geophysical and Soil-Gas Survey

The intent of a ~~1992~~ geophysical and soil-gas survey was to delineate the landfill boundary and identify containers and/or contaminant plumes that may have been in the Combined SWMU 9 area. Following these surveys, exploratory trenches were excavated to identify the source of geophysical anomalies and soil-gas hot spots. The excavations allowed the landfill contents to be visually observed at selected locations, but significant quantities of buried metallic containers or sources for soil-gas hot spots were not conclusively identified. The landfill is generally covered with 1 to 3 feet of sand and/or sandy silt. Complete geophysical and soil-gas investigation findings are in Appendix E of the Final Zone H RFI.

Media

Because of its inherent mobility, groundwater contamination is addressed in the RFI as an overall Combined SWMU 9 issue. Likewise, due to its relative immobility, soil and sediment are addressed site-specifically. For example, SWMU 121 soil was investigated on a site-specific basis, yet SWMU 121 groundwater has been investigated as part of Combined SWMU 9.

Area

The approximately 50-acre SWMU 9 includes a running track, two ballfields, and the EnSafe field trailer site. SWMU 20, immediately west of SWMU 9, adds approximately 20 more acres for a total Combined SWMU 9 area of approximately 70 acres.

5.1.1 Current Use

The United States Border Patrol Training Academy (USBPTA), a recent tenant at the former naval base, frequently uses the running track for physical conditioning. The two baseball fields are in disrepair and are not used by any of the current tenants at the former base. The EnSafe field trailer site is on the central-western portion of SWMU 9. The balance of Combined SWMU 9 consists of grassed fields, wetlands, medium-sized brush and wooded areas, a transformer

substation, and several vacant buildings (Buildings 672 and 673) approximately 75 yards north of the EnSafe field trailer site.

5.1.2 Future Use

The Charleston Naval Complex Redevelopment Authority would like to use this area for industrial purposes in the future, provided development is not overly restricted by current site conditions. However, since Combined SWMU 9 is a landfill, it will unlikely be developed for anything more intensive than recreational or other limited-use.

Many landfills, military and municipal alike, have been successfully redeveloped for recreational purposes such as athletic fields, golf courses, parks, picnicking areas, nature trails and wildlife preserves. In addition, some municipalities are actively designing landfills with a recreational end-use in mind. As an example, Mount Trashmore in Virginia Beach, Virginia, is a fully operational recreational asset to the city and its families. Mount Trashmore is a former municipal landfill closed 15 years ago, yet it is presently used for athletic fields, boating, walking and cycling, picnicking and kite flying. A community-sponsored and -constructed Kids' Kove Playground was also part of the recreational end-use envisioned for this landfill well before it was closed.

5.1.3 ISM Status

No ISM activities have been completed by the Navy Environmental Detachment (Navy DET) at Combined SWMU 9.

5.1.4 Fate and Transport Summary

To evaluate fate and transport, constituents detected in Combined SWMU 9 groundwater were compared to those detected in soil samples from SWMUs 19, 20, and 121, and AOCs 649, 650, and 651. Maximum concentrations in groundwater and soil were compared to relevant fate-and-

transport screening criteria to highlight potential migration pathways. This screening process identified nine constituents (primarily VOCs and inorganics) with the potential to migrate from soil to groundwater. Because much of these contaminants are buried within landfill wastes below the groundwater table, soil to groundwater contaminant transfer is imminent.

The primary remedial objective for groundwater will be issues related to offsite migration of groundwater contamination and its effect on potential ecological receptors in Shipyard Creek. The area of greatest concern with regards to offsite migration is in the western portion of the site south of SWMUs 20 and 19 near GEL well MW-15. Chlorobenzene was detected in this GEL well which is located within 100 feet of both the property line and the headwaters of Shipyard Creek. Additional wells and groundwater sampling are proposed as part of this CMS to further assess groundwater in this area.

Surface soil to sediment migration pathways were also evaluated and erosional processes were apparent for SWMUs 19, 20, and 121. Therefore, these sites' surface material will be considered during the ecological risk evaluation during the CMS process for Combined SWMU 9.

5.1.5 Human Health Risk Assessment Summary

Updated Risk and Hazard Calculations

Point and site surface soil risk and hazard values in the RFI were recalculated for this CMS WP using updated slope factors for PCBs and ½ the sample quantification limit for compounds not detected but analyzed for. Slope factors for the PCBs Aroclor-1254 and 1260, previously 7.7 $mg^{-1}kg^{-1}day^{-1}$, were adjusted to 2.0 $mg^{-1}kg^{-1}day^{-1}$. Risk and hazard calculations are summarized in Appendix A. Additional risk assessment information not described in this work plan can be found in Section 6 of the Zone H RFI.

Surface Soil Risk Above Background

Per USEPA Subpart S Initiative, *Corrective Action for Releases from Solid Waste Management Units at Hazardous Waste Management Facilities; Proposed Rule, 1996,* no attempt will be made to propose a cleanup level that restores the site to risk levels more protective than risks produced by native materials.

Table 5.1.1 summarizes background study results for Zone H in terms of surface soil risk and hazard. Where applicable, these values were subtracted from each compounds contribution to total site surface soil risk and hazard. For example, arsenic's background risk is 4.1E-05. If arsenic's contribution to total site risk was 9.7E-05, its contribution to site risk would be reduced by its background value (4.1E-05) and yield a contribution of 5.6E-05 risk above background. Likewise if arsenic's total risk were less than background, its contribution to site risk above background would be zero.

Uncertainty in Risk Assessment

As stated in the Zone H RFI and in accordance with USEPA protocol, the risk assessment methodology is a very conservative process which produces results extremely protective of human health. This fact should be considered when setting cleanup goals consistent with future site reuse.

Uncertainty is a factor in each step of the exposure and toxicity assessments, and uncertainty associated with the initial risk assessment stages is magnified when combined with other uncertainties. Together, the use of high-end estimates of potential exposure concentrations, frequencies, duration, and rates lead to conservative estimates of chronic daily intake (CDI). For example, animals' toxicological responses to certain chemicals are extrapolated to hypothesize a potential human response. Safety factors are applied during these extrapolations to provide an adequate margin of safety in estimating the potential human response. The end effect is a risk assessment that is extremely protective of the potential human receptor.

Table 5.1.1
NAVBASE - Charleston Zone H
Corrective Measures Study
Risk/Hazard Associated with Background Inorganics

	Residential					Industrial			
Parameter	**Reference Conc. (Mg/kg)**	**RBC @ HI=1**	**RBC @ 1E-6**	**Background Hazard**	**Background Risk**	**RBC @ HI=1**	**RBC @ 1E-6**	**Background Hazard**	**Background Risk**
B(a)P Equivalents (BEQ)	0.424	NA	0.06	NA	6.7E-06	NA	0.30	NA	1.4E-06
Aluminum	26000	72927	NA	3.6E-01	NA	NA	NA	NA	NA
Arsenic	15.6	21.9	0.38	7.1E-01	4.1E-05	435	2.71	4E-02	5.8E-06
Beryllium	1.37	365	0.13	3.8E-03	1.1E-05	7248	0.94	2E-04	1.5E-06
Cadmium	1.05	73	NA	1.4E-02	NA	NA	NA	NA	NA
Chromium	59.1	72927	NA	8.1E-04	NA	NA	NA	NA	NA
Copper	27.6	2917	NA	9.5E-03	NA	53782	NA	5E-04	NA
Manganese	583	3850	NA	1.6E-01	NA	67800	NA	9E-03	NA
Mercury	0.485	22	NA	2.2E-02	NA	435	NA	1E-03	NA
Nickel	33.4	1459	NA	2.3E-02	NA	28993	NA	1E-03	NA
Thallium	1.1	5.8	NA	1.9E-01	NA	116	NA	9E-03	NA
Vanadium	73	510	NA	1.4E-01	NA	10148	NA	7E-03	NA
Zinc	214	21878	NA	9.8E-03	NA	434894	NA	5E-04	NA
Cumulative Background Hazard				1.6	—	—	—	0.1	—
Cumulative Background Risk				—	5.9E-05	—	—	—	8.7E-06

Combined SWMU 9 Human Health Risk and Hazard Summary

Table 5.1.2 summarizes risk and hazard in excess of Zone H background. Soil is presented on a site specific basis. Groundwater is presented on a zone-wide basis. The following subsections interpret these results in terms of future CMS activities.

Table 5.1.2
Combined SWMU 9
Site Human Health Risk and Hazard above Background[1]

		Surface Soil		Shallow GW		Deep GW	
		HI[2]	ILCR[3]	HI	ILCR	HI	ILCR
SWMU 9 (combined)	Res.[4]	See Individual Site Results below.		26 (1st qtr) 15 (2nd qtr)	1E-1 (1st qtr) 2E-3 (2nd qtr)	140 (1st qtr) 17 (2nd qtr)	3E-6 (1st qtr) 0.0 (2nd qtr)
	Ind.[4]	"		4 (1st qtr) 2 (2nd qtr)	3E-2 (1st qtr) 7E-4 (2nd qtr)	21 (1st qtr) 3 (2nd qtr)	1E-6 (1st qtr) 0.0 (2nd qtr)
SWMU 19	Res.	0.35	7.1E-6	See Combined SWMU 9 Results above			
	Ind.	0.02	1.4E-6				
SWMU 20	Res.	NA	9.4E-6	"			
	Ind.	NA	1.9E-6				
SWMU 121	Res.	3.30	7.0E-5	"			
	Ind.	0.25	1.2E-5				
AOCs 649, 650, and 651	Res.	NA	8.1E-6	"			
	Ind.	NA	1.6E-6				

Notes:

1 — Maximum background risk in shallow surface soil =arsenic (4.1E-5 Res.; 5.8E-6 Ind.); beryllium (1.1E-5 Res.;1.5E-6 Ind.); BEQ (6.7E-6 Res.; 1.4E-6 Ind.).
Maximum background hazard shallow surface soil =arsenic (0.71 Res.; 0.04 Ind.); beryllium (0.004 Res.;0.0 Ind.); BEQ (0.0 Res.;0.0 Ind.).

2 — Cumulative hazard is presented as HI (hazard index). For sites with no inorganic COCs, hazard is generally not applicable.

3 — Cumulative risk is presented as ILCR (incremental lifetime cancer risk).

4 — Residential risk and hazard are for a child; Industrial risk and hazard are for an adult site worker.

NA — Not applicable.

SWMU 19 Surface Soil - The primary contributors to surface soil risk above background (7.1 E-6 Res.; 1.4E-6 Ind.) are BEQs (4.7E-6 Res; 0.9E-6 Ind) and Aroclor-1260 (1.6E-6 Res; 0.3E-6 Ind.). The site hazard quotient (0.35 Res; 0.02 Ind) is less than 1, and does not warrant further action. Surface soil risk above background is shown on Figures 5.1.1 and 5.1.2.

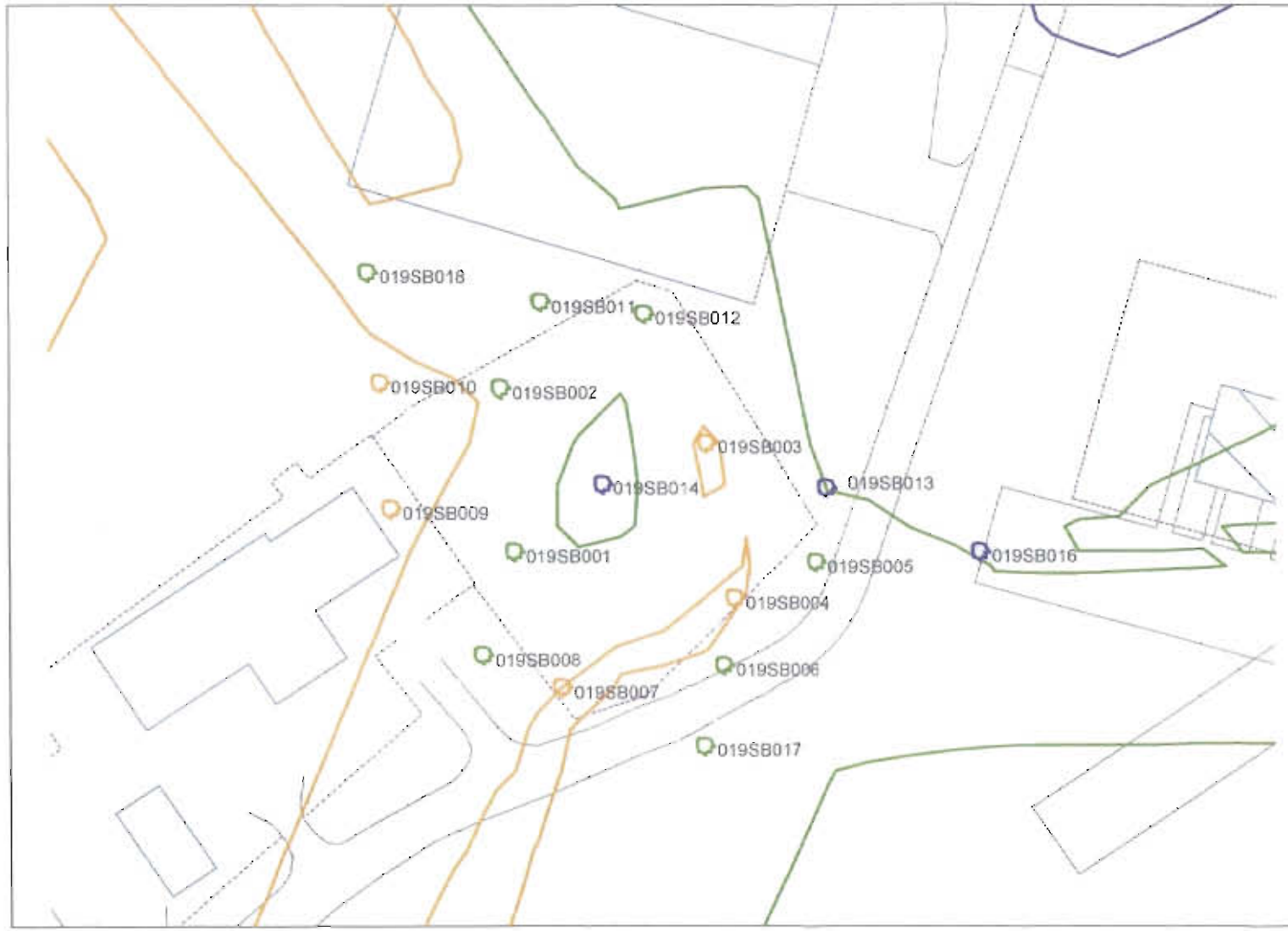
No further action at this site would result in a residual industrial scenario risk of 1.4E-6 above background for surface soil.

SWMU 20 Surface Soil - The primary contributors to surface soil risk (9.4E-6 Res; 1.9E-6 Ind) at this site are BEQs. However, the sample point exhibiting the greatest amount of risk (019-SB-011-01) was non-detect for BEQs (½ the sample quantification limit is used as a default value in risk calculations for non-detect samples). If this point is ignored, site risk above background drops to 6.6E-6 Res. and 0.7E-6 Ind.

Surface soil risk above background is shown on Figures 5.1.3 and 5.1.4.

No further action at this site would result in a residual industrial risk of 0.7E-6, if the non-detect default values for 019-SB-011-01 are ignored.

SWMU 121 Surface Soil - The primary contributors to surface soil risk (7.0E-5 Res; 1.2E-5 Ind) above background at this site are beryllium (4.3E-5 Res; 6.2E-6 Ind), BEQs (1.4E-5 Res; 2.7E-6 Ind), and Aroclor-1254 (9.7E-6 Res; 2.0E-6 Ind). If the sample point exhibiting the greatest amount of risk above background (121-SB-007-01) was removed, site risk above background would drop to 5E-5 Residential and 7E-6 Industrial. Surface soil risk above background is shown on Figures 5.1.5 and 5.1.6.



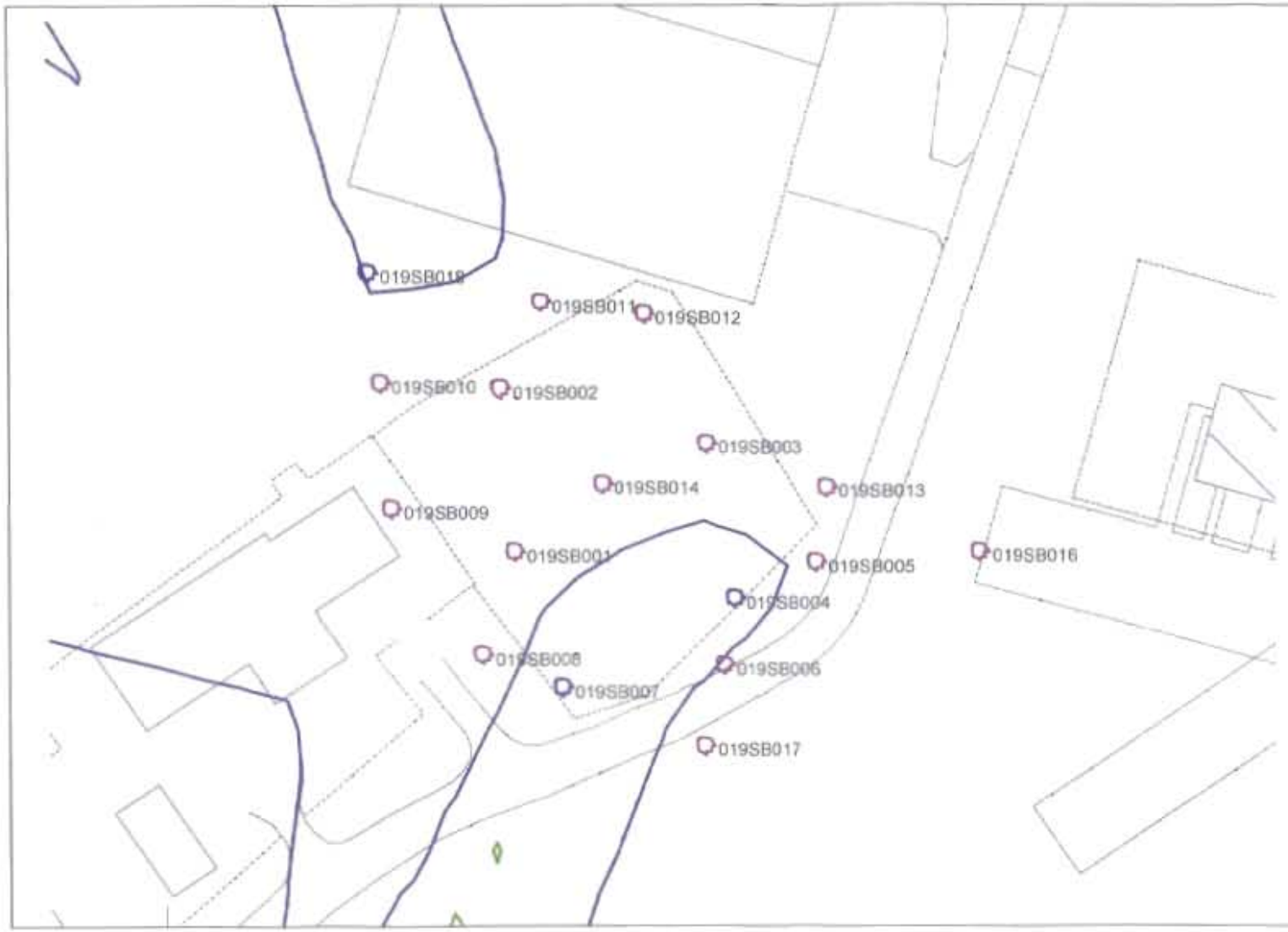
CMS WORK PLAN
Charleston Naval Base
Zone H
CHARLESTON, S.C.

Figure 5.1.1
Surface Soil Risk Above Background
Residential
SWMU 19

Legend
- Residential Risk > 1E-4
- Residential Risk between 1E-5 and 1E-6
- Residential Risk between 1E-6 and 1E-7
- Residential Risk below background level**
- Residential Risk between 1E-4 and 1E-5
- Residential Risk < 1E-7
- ** or sample was non-detect for risk drivers
- Water
- Pier
- Road
- Bldg
- Fence

N
W
E
S

1:60



CMS WORK PLAN

Charleston Naval Base
Zone H
CHARLESTON, S.C.

Figure 5.1.2
Surface Soil Risk Above Background
Industrial
SWMU 19

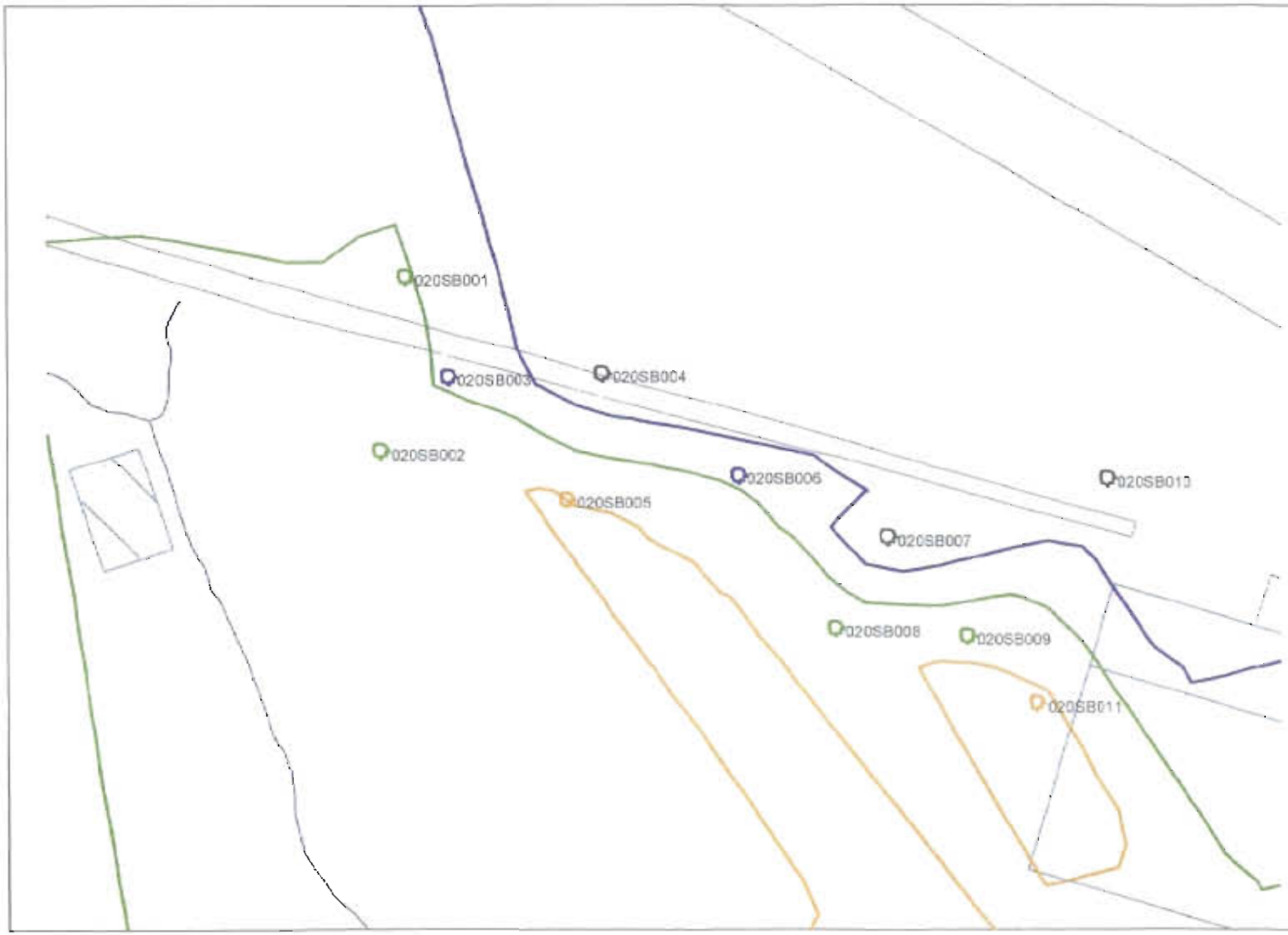
Legend
- Industrial Risk > 1E-4
- Industrial Risk between 1E-5 and 1E-6
- Industrial Risk between 1E-6 and 1E-7
- Industrial Risk below background**
- Industrial Risk between 1E-4 and 1E-5
- Industrial Risk < 1E-7

**or sample was non-detect for risk drivers

- Water
- Pier
- Road
- Bldg
- Fence

N
W
E
S

1:65



CMS WORK PLAN
Charleston Naval Base
Zone H
CHARLESTON, S.C.

Figure 5.1.3
Surface Soil Risk Above Background
Residential
SWMU 20

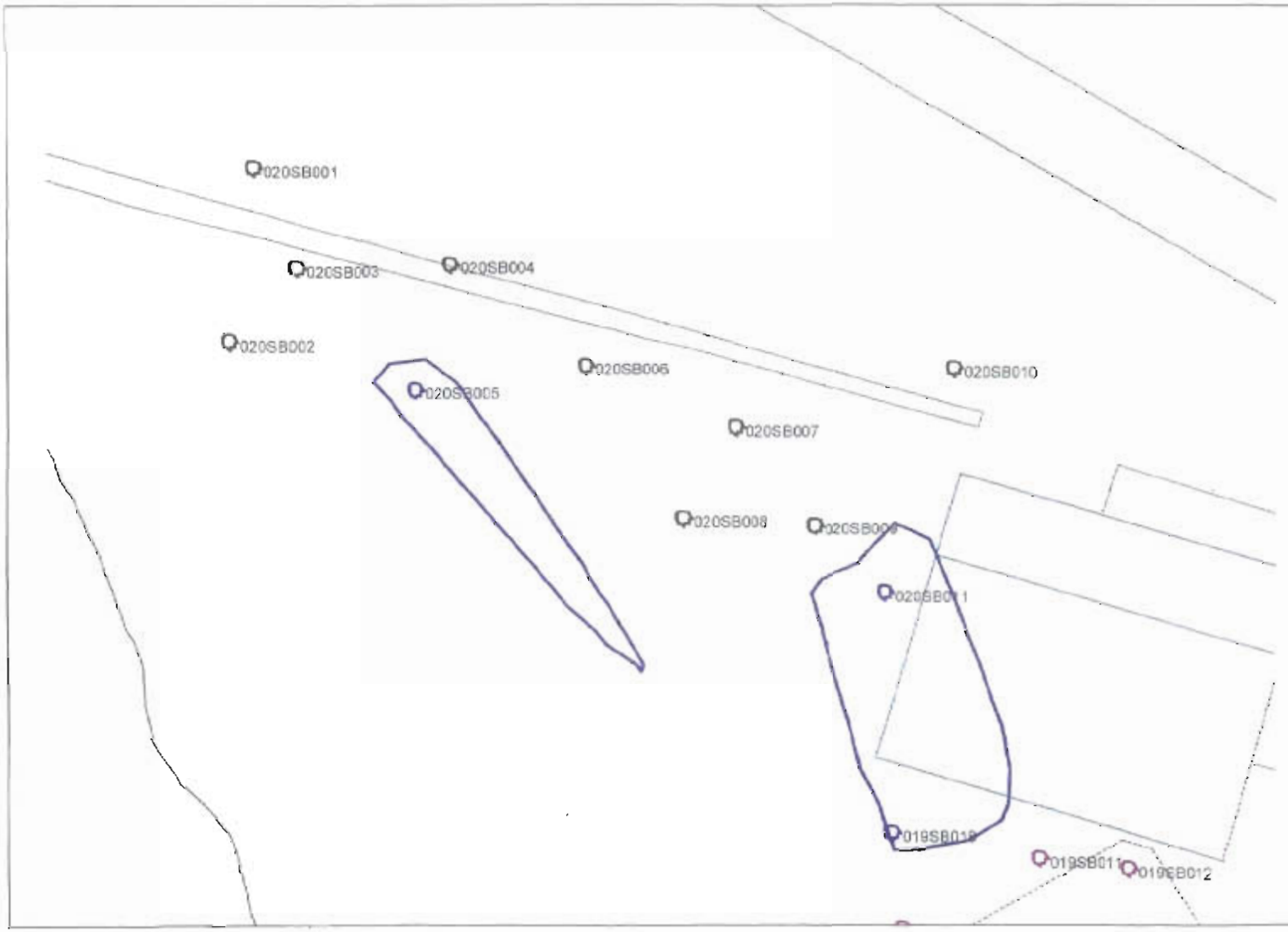
Legend
- Residential Risk > 1E-4
- Residential Risk between 1E-5 and 1E-6
- Residential Risk between 1E-6 and 1E-7
- Residential Risk below background level**
- Residential Risk between 1E-4 and 1E-5
- Residential Risk < 1E-7

** or sample was non-detect for risk drivers

- Water
- Pier
- Road
- Bldg
- Fence

N
W
E
S

1:75



CMS WORK PLAN

Charleston Naval Base
Zone H
CHARLESTON, S.C.

Figure 5.1.4
Surface Soil Risk Above Background
Industrial
SWMU 20

Legend
- Industrial Risk > 1E-4
- Industrial Risk between 1E-5 and 1E-6
- Industrial Risk between 1E-6 and 1E-7
- Industrial Risk below background* *
- Industrial Risk between 1E-4 and 1E-5
- Industrial Risk < 1E-7

** or sample was non-detect for risk drivers

- Water
- Pier
- Road
- Bldg
- Fence

N
W
E
S

1.75

CMS WORK PLAN
Charleston Naval Base
Zone H
CHARLESTON, S.C.

Figure 5.1.5
Surface Soil Risk Above Background
Residential
SWMU 121

Legend
- Residential Risk > 1E-4
- Residential Risk between 1E-5 and 1E-6
- Residential Risk between 1E-6 and 1E-7
- Residential Risk below background level**
- Residential Risk between 1E-4 and 1E-5
- Residential Risk < 1E-7

**or sample was non-detect for risk driver

- Water
- Pier
- Road
- Bldg
- Fence

N
W
E
S

1:60

CMS WORK PLAN
Charleston Naval Base
Zone H
CHARLESTON, S.C.

Figure 5.1.6
Surface Soil Risk Above Background
Industrial
SWMU 121

Legend
- Industrial Risk > 1E-4
- Industrial Risk between 1E-5 and 1E-6
- Industrial Risk between 1E-6 and 1E-7
- Industrial Risk below background**
- Industrial Risk between 1E-4 and 1E-6
- Industrial Risk < 1E-7
- ** or sample was non-detect for risk drivers
- Water
- Pier
- Road
- Bldg
- Fence

N
W
E

1:65

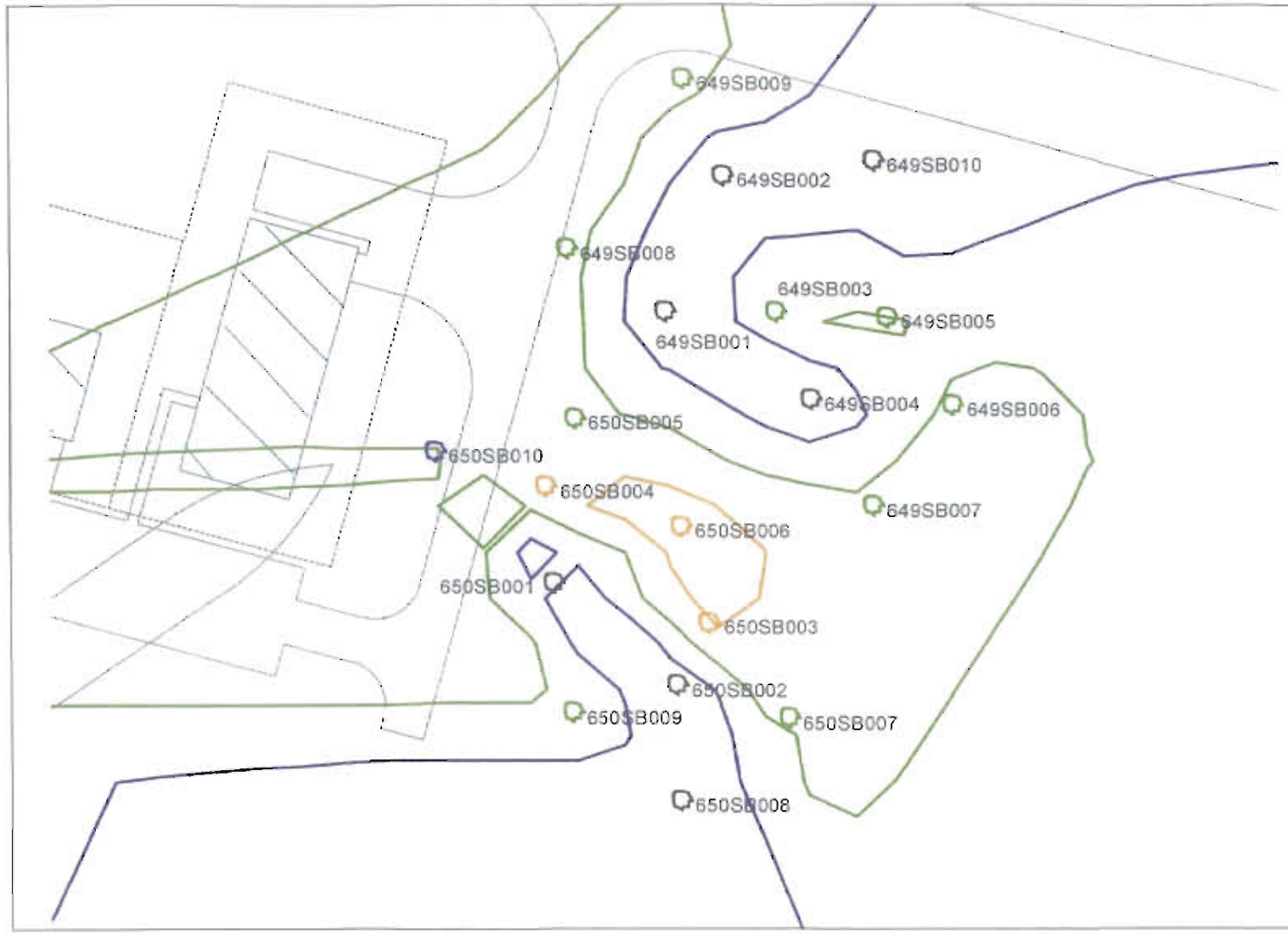
AOCs 649, 650, and 651 Surface Soil - The sole contributors to surface soil risk (8.1E-6 Res; 1.6E-6 Ind) above background at this site are BEQs. If the sample point driving the greatest amount of risk above background (650-SB-006-01) was removed, site risk above background would drop to 3.9-E6 Residential and 0.4E-6 Industrial. Surface soil risk above background is shown on Figures 5.1.7 and 5.1.8.

No further action at this site would result in a residual industrial risk of 1.6E-6 for surface soil.

Combined SWMU 9 Groundwater - Chlorobenzene, Dichlorobenzene, and Trichloroethene contours are shown on Figures 5.V, 5.W, and 5.X. Other compounds did not display the type of continuity needed to produce beneficial contouring. However, call-out boxes on Figures 5.1.9 and 5.1.10 provide round-by-round data for all Combined SWMU 9 primary organic and inorganic COCs in groundwater.

The primary contributors to onsite shallow groundwater risk are chlorinated benzenes, chlorinated alkanes/alkenes, arsenic, antimony, alkaphenols, and aromatic hydrocarbons. Risk dropped two orders of magnitude from the first to second quarter sampling due the disappearance of benzidine in all second-quarter samples.

The primary contributors to residential risk and hazard for deep groundwater are chloroform, and thallium, a ubiquitous inorganic in area groundwater. However, 2nd quarter sampling showed a risk of only 1E-6. Continued deep well monitoring is proposed as part of this CMS in order to more adequately assess the long-term threat to deep groundwater.



CMS WORK PLAN

Charleston Naval Base
Zone H
CHARLESTON, S.C.

Figure 5.1.7
Surface Soil Risk Above Background
Residential
AOC 649/650/651

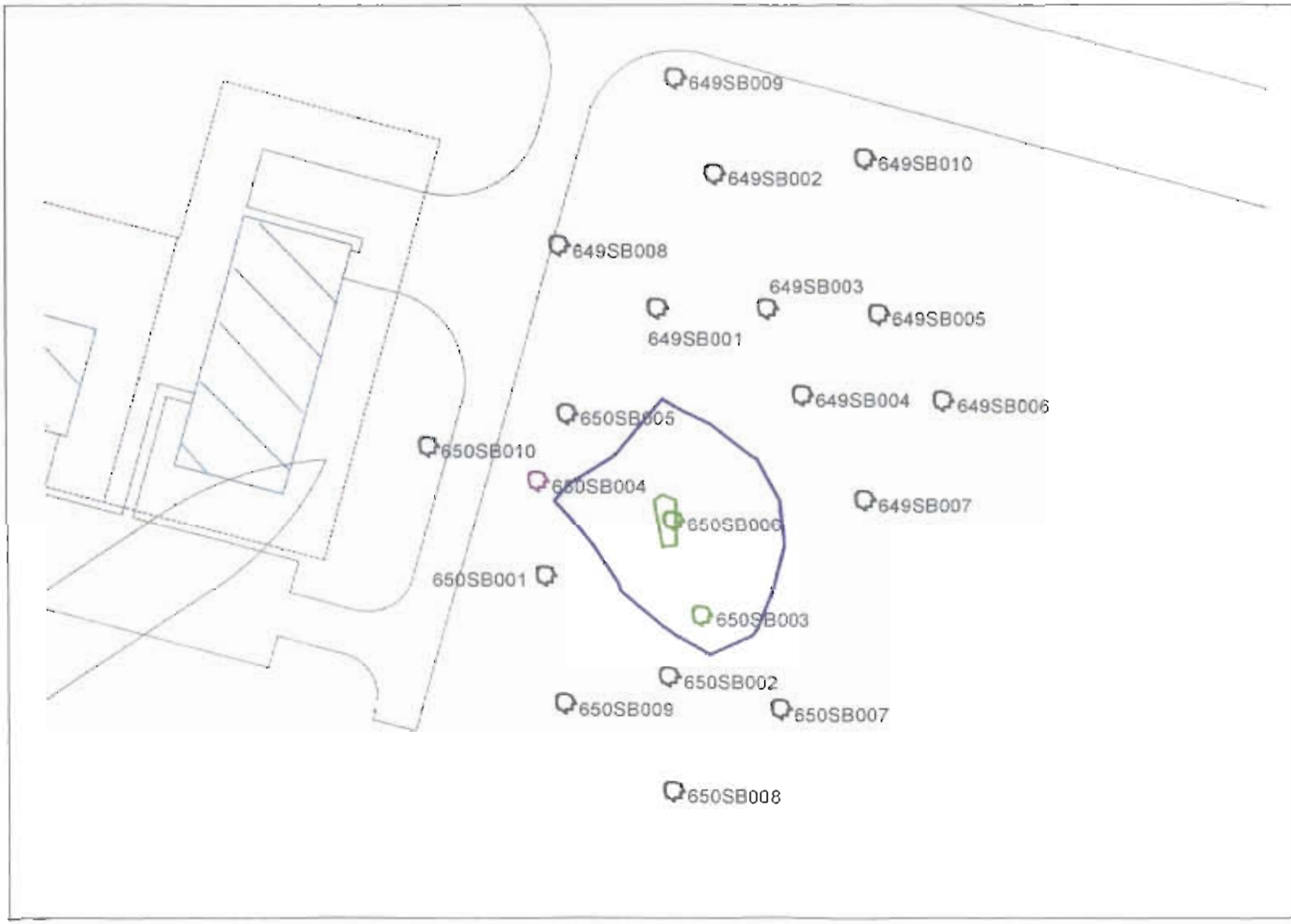
Legend
- Residential Risk > 1E-4
- Residential Risk between 1E-5 and 1E-6
- Residential Risk between 1E-6 and 1E-7
- Residential Risk below background level**
- Residential Risk between 1E-4 and 1E-5
- Residential Risk < 1E-7

** or sample was non-detect for risk drivers

- Water
- Pier
- Road
- Bldg
- Fence

N
W
E
S

1:60



CMS WORK PLAN
Charleston Naval Base
Zone H
CHARLESTON, S.C.

Figure 5.1.8
Surface Soil Risk Above Background
Industrial
AOC 649/650/651

Legend
- Industrial Risk > 1E-4
- Industrial Risk between 1E-5 and 1E-6
- Industrial Risk between 1E-6 and 1E-7
- Industrial Risk below background* *
- Industrial Risk between 1E-4 and 1E-5
- Industrial Risk < 1E-7

** or sample was non-detect for risk drivers

- Water
- Pier
- Road
- Bldg
- Fence

N
W
E
S

1:50

5.1.6 Ecological Risk Assessment Summary

Based on surface soil samples collected throughout ecological subzone H-1 (which includes SWMUs 19 and 20, and AOCs 649, 650, and 651), the primary ecological risk to infaunal and terrestrial wildlife and vegetation is from inorganic constituents and low but widespread concentrations of PAH compounds (refer to Figures 7.4 to 7.7 of the RFI). The primary inorganics contributing to risk are mercury, zinc, and copper. SWMU 121 is in subzone H-2 and it appears to pose an ecological risk due to inorganics in surface soil (refer to Figures 7.8 to 7.10)

After evaluating site data and Zone H background data, investigators concluded that AOCs 649, 650, and 651 do not pose an ecological risk that exceeds inherent risk due to background constituents. However, zinc and copper drove unacceptable ecological risks for the short-tailed shrew and rabbit at SWMU 19 (Figures 7.5 to 7.7 of the RFI). SWMU 121 contained zinc, copper and mercury at concentrations considered unacceptable to the rabbit and robin. Zinc and copper concentrations exceeded background at SWMU 121.

Because surface soil at SWMUs 19 and 121 may pose an unacceptable risk to ecological receptors, it will be considered during the CMS process. However, Zone J RFI results will need to be fully evaluated to assess Combined SWMU 9 contributions to ecological risk, including groundwater-to-surface water transport and sediment loading to Shipyard Creek.

5.1.7 Remedial Objectives

Landfill Presumptive Remedy

Per project team consensus, the CMS for Combined SWMU 9 will apply the USEPA presumptive remedy for CERCLA municipal landfills in developing alternatives for *onsite* soils, sediments, and groundwater. Enhancements to the presumptive remedy will be evaluated during the CMS to address *offsite* migration of groundwater and sediment contamination and to address *onsite* concerns where applicable.

Per USEPA Directive No. 9355.0-62FS, *Application of the CERCLA Municipal Landfill Presumptive Remedy to Military Landfills (interim guidance),* the following is quoted:

> *Presumptive remedies are preferred technologies for common categories of sites based on historical patterns of remedy selection and USEPA's scientific and engineering evaluation of performance data on technology implementation. By streamlining site investigation and accelerating the remedy selection process, presumptive remedies are expected to ensure the consistent selection of remedial actions and reduce cost and time required to clean up similar sites. Presumptive remedies are expected to be used at all appropriate sites. Site-specific circumstances dictate whether a presumptive remedy is appropriate at a given site.*
>
> *USEPA established* ***source containment*** *as the presumptive remedy for CERCLA municipal landfill sites in September of 1993. The municipal landfill presumptive remedy should also be applied to all appropriate military landfills.*

A large portion of the CMS work plan for Combined SWMU 9 has been developed in accordance with a presumptive remedy approach. A few key points regarding the application of the presumptive remedy follow.

Source containment as a presumptive remedy primarily includes:

- Containment of the landfill mass via capping
- Collection and/or treatment of landfill gas, as applicable

The presumptive remedy may include:

- Collection and/or treatment of leachate, as applicable
- Measures to control affected groundwater at the perimeter, as applicable
- Measures to control infiltration or upgradient groundwater, as applicable

Within the confines of the landfill area, the presumptive remedy should avoid:

- Remediation of groundwater
- Remediation of contaminated surface water and sediments
- Remediation of contaminated wetland areas

Considering either industrial or residential reuse for Combined SWMU 9, both risk and hazard estimates exceed generally acceptable ranges for groundwater. However, these risk values are based on human receptors within the Combined SWMU 9 area. Because much of the source material for observed groundwater contamination is buried below the water table within the landfill area, active remediation of onsite shallow groundwater contamination is not a feasible goal for this CMS. Instead, primary groundwater concerns are offsite migration of the shallow groundwater plume and protection of the deeper aquifer.

Though treatment of contaminated soil or landfill mass is not considered part of the presumptive remedy, one exception does exist. Waste material hot-spots may be characterized and treated if: (1) the waste material hot-spot is expected to threaten the integrity of an existing or potential containment system, or (2) the excavation and treatment or capping of the hot-spot would be technically feasible, cost-effective, and result in a significant reduction in risk at the site.

Surface Soil and Waste Material Remedial Objectives Distinction

The RFI did not produce evidence of waste material hot-spots at Combined SWMU 9. Therefore, the excavation and treatment of landfill material identified as "hot-spot waste" does not apply as a potential remedial alternative. However, surface soils posing unacceptable risk or hazard at selected sites within Combined SWMU 9 may be excavated or capped as part of the final remedy for this site. Excavation or capping of surface soils will be identified, evaluated, and proposed in the CMS if the surface soil contributes to unacceptable risks to human or ecological receptors, or if the surface soil poses a fate and transport concern to nearby marsh areas.

Combined SWMU 9 Remedial Objectives

Given the assumptions made in using the presumptive remedy at landfill sites, the primary remedial objectives for Combined SWMU 9 are:

- Containment of landfill mass
- Exposure control of surface soil known to pose unacceptable risks to human health or the environment
- Groundwater monitoring at the southern landfill boundary to maintain the quality of the adjacent water body, Shipyard Creek, and to protect potential ecological receptors by demonstrating compliance with applicable surface water quality and sediment standards, or no-further-degradation policies.

5.1.8 Potential Remedial Alternatives

Proposed remedial alternative(s) for this site are:

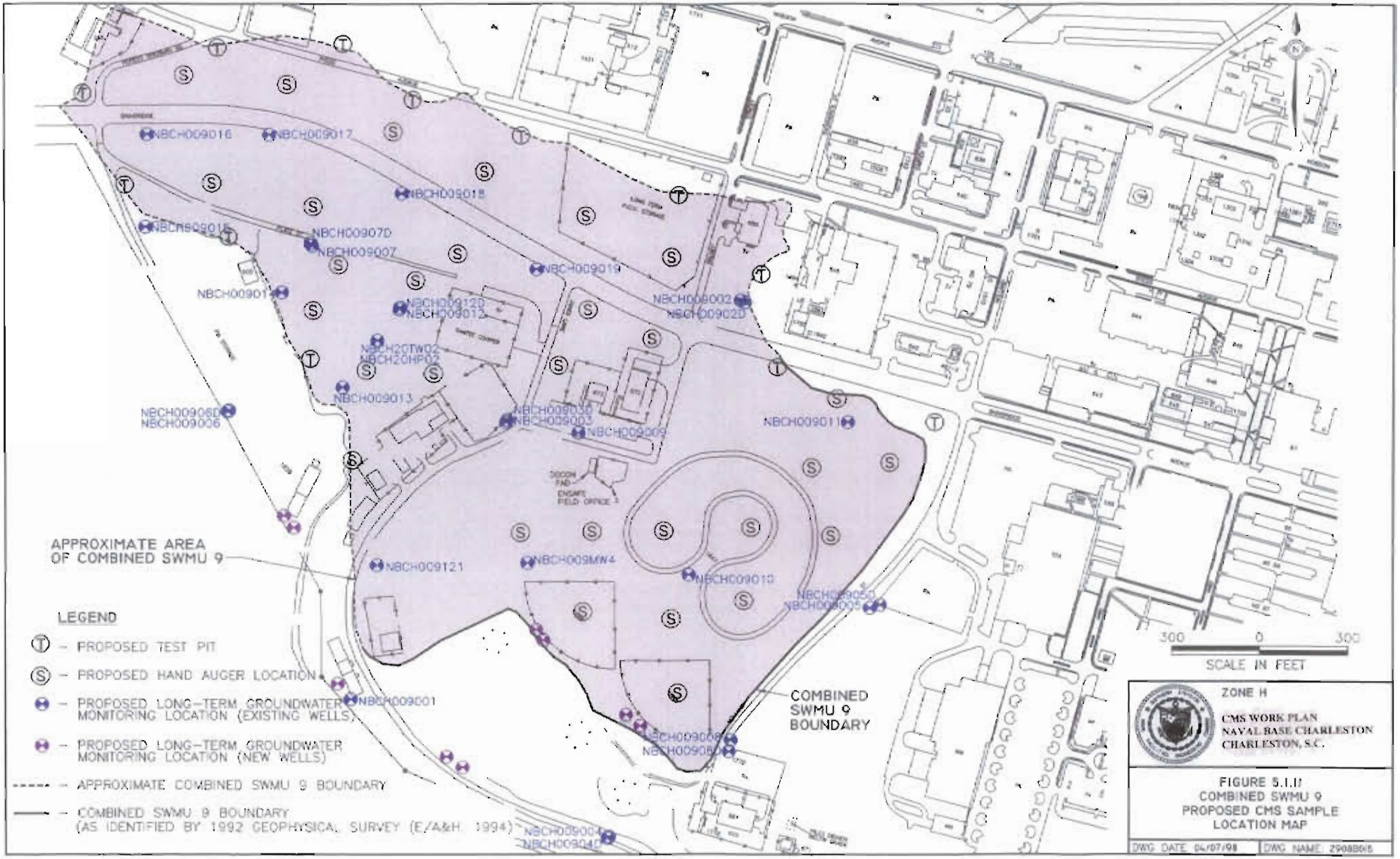
- Full or partial surface capping
- Hot-spot surface soil excavation
- Long-term (e.g., one to five year) monitoring of shallow and deep groundwater perimeter wells
- If needed, boundary controls (including natural or enhanced attenuation) to prevent or reduce offsite migration of groundwater contaminants
- Institutional controls applicable to landfills (e.g., limited redevelopment)

5.1.9 CMS Data Needs

Based on site-specific issues and the use of the presumptive remedy approach for landfills at Combined SWMU 9, the following activities are being proposed:

- Completion of approximately 12 small test pits along the northern landfill boundary to confirm results of the geophysical survey
- Installation of one deep well to be paired with existing shallow well NBCH009001 and two additional nested pairs of shallow/deep wells to monitor groundwater quality along the property boundary adjacent to Shipyard Creek
- Installation of two nested pairs of shallow/deep wells south of the former softball fields to assess attenuation or retention of groundwater contaminants by natural processes in the impounded wetland between the landfill and Shipyard Creek
- Installation of three additional shallow wells to assess groundwater quality and aquifer characteristics associated with the chlorobenzene detected in GEL well MW-15.
- Procurement of surface soil samples on a grid pattern across SWMU 9 to evaluate the thickness of existing cap material
- Review of the Zone J RFI (upon its completion)

Where applicable, Figure 5.1.11 shows the proposed CMS sampling locations.


NBCH009016
NBCH009017
NBCH009018
NBCH009015
NBCH00907D
NBCH00900Z
NBCH009019
NBCH009014
NBCH009012D
NBCH009012
NBCH20TW02
NBCH20HP02
NBCH009013
NBCH009002
NBCH00902D
NBCH009006D
NBCH009006
NBCH009030
NBCH009003
NBCH009009
NBCH009011
APPROXIMATE AREA
OF COMBINED SWMU 9
NBCH009121
NBCH009MW4
NBCH009010
NBCH009050
NBCH009005
NBCH009001
COMBINED
SWMU 9
BOUNDARY
NBCH009004
NBCH009040
LEGEND
Ⓣ – PROPOSED TEST PIT
Ⓢ – PROPOSED HAND AUGER LOCATION
– PROPOSED LONG-TERM GROUNDWATER MONITORING LOCATION (EXISTING WELLS)
– PROPOSED LONG-TERM GROUNDWATER MONITORING LOCATION (NEW WELLS)
– APPROXIMATE COMBINED SWMU 9 BOUNDARY
– COMBINED SWMU 9 BOUNDARY (AS IDENTIFIED BY 1992 GEOPHYSICAL SURVEY (E/A&H 1994)
300 0 300
SCALE IN FEET
ZONE H
CMS WORK PLAN
NAVAL BASE CHARLESTON
CHARLESTON, S.C.
FIGURE 5.1.1
COMBINED SWMU 9
PROPOSED CMS SAMPLE
LOCATION MAP
DWG DATE 04/07/98
DWG NAME 2908B05

5.3 SWMU 17

SWMU 17 is the site of an oil spill from a ruptured underground fuel pipe beneath Building 61. The 1987 rupture released approximately 14,000 gallons of fuel oil beneath the north-central extension of the building. As an interim stabilization measure intended to collect the fuel oil, sumps were later installed along the edges of the building near where the spill was thought to have occurred.

PCBs were present in multiple soil samples, and PCB-containing dense non-aqueous phase liquid (DNAPL) was present in one well (NBCH017002) north of the building. At the time of the spill, the building was used for submarine operator training; submarine simulators often have PCB oil in their cooling and hydraulic systems. In addition, a large bank of transformers on the north side of the building may have caused or contributed to PCB contamination at the site.

5.3.1 Current Use

Building FBM 61 is presently occupied by the USBPTA. The Border Patrol uses this building for classroom instruction, general administration, and warehousing of minimal amounts of dry goods such as classroom and general building maintenance supplies.

5.3.2 Future Use

According to the Charleston Naval Complex Redevelopment Authority, this area will likely be used for government training in the future. Government training operations might require administrative buildings, classrooms for adults, meeting rooms, etc. Projected future use is consist with current use.

5.3.3 ISM Status

No ISM have been completed by the Navy Environmental Detachment at SWMU 17. However, the Detachment has recently been tasked to monitor the site sumps and groundwater wells for

NAPL (non-aqueous phase liquid). If NAPL is identified, it will be measured for thickness, then removed, analyzed, and disposed of by the detachment.

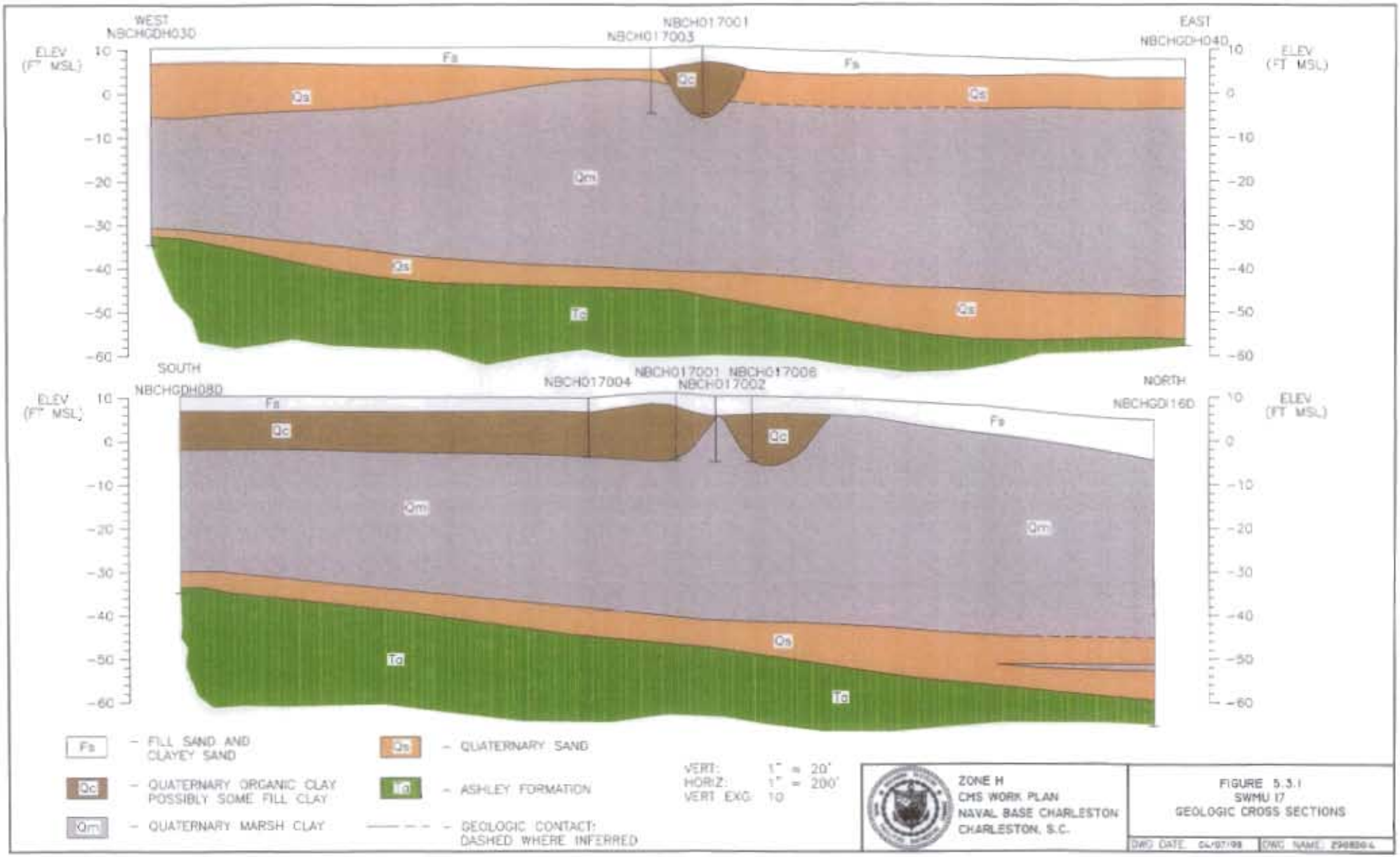
5.3.4 Fate and Transport Summary

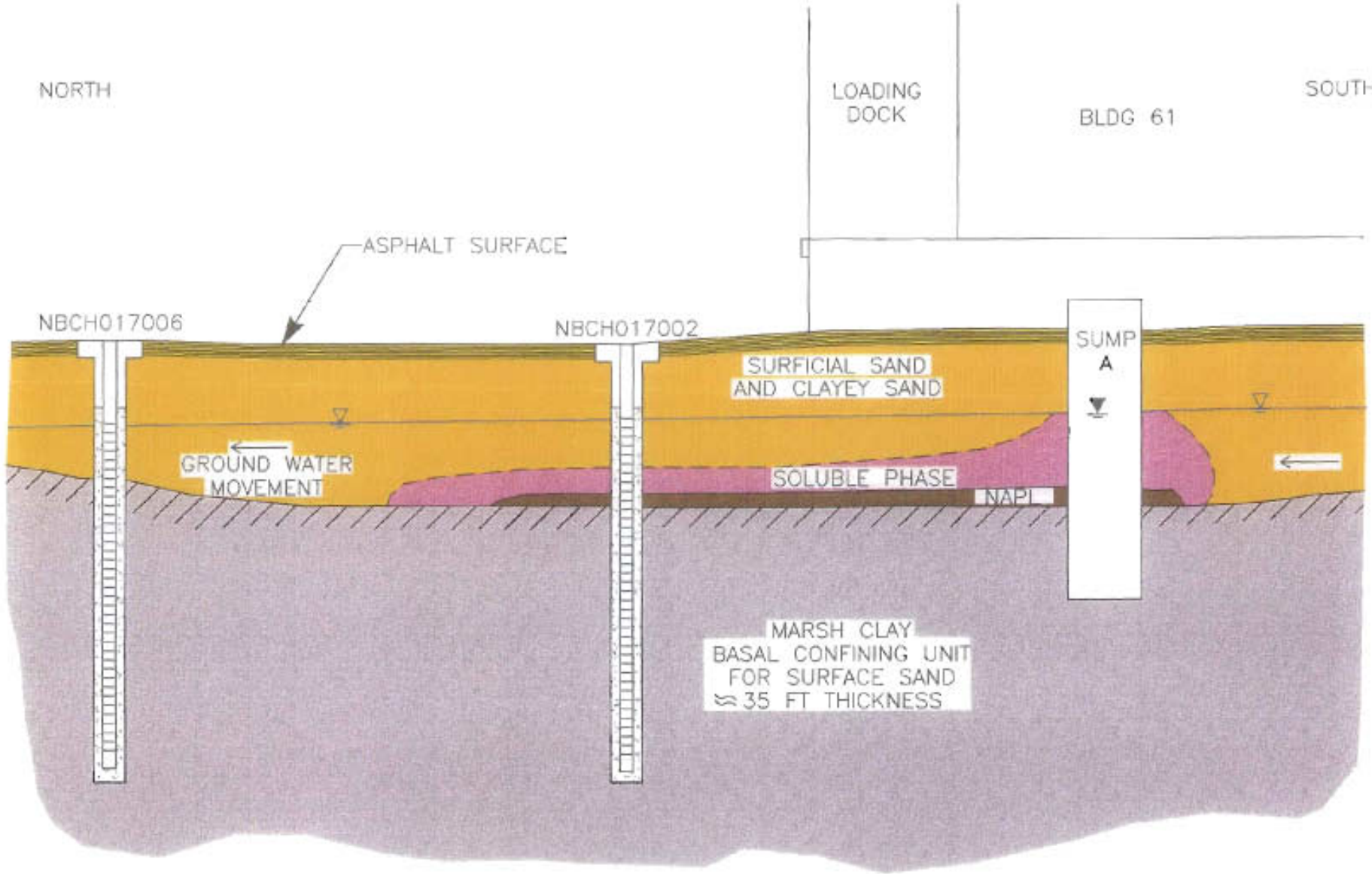
Non-aqueous Phase Liquids (NAPLs)

Both Dense NAPLs and Light NAPLs were encountered at this site. Light non-aqueous phase liquid (LNAPL), in the form of fuel oil, was reported in the sumps adjacent to the building, and DNAPL (PCB oil) was reported in the NBCH017002 monitoring well during the third round of groundwater sampling.

Dense NAPLs are heavier than water and sink through the groundwater table until hitting an obstruction such as a confining unit (e.g., clay, rock, manmade structure). A DNAPL will continue to contaminate groundwater through diffusion until it is completely removed. For some sites, it is technically infeasible to remove the DNAPL because of buildings over the contaminated area or hydrogeologic conditions that are not conducive to DNAPL extraction. Locating DNAPL sources can also be difficult due to the isolated nature of DNAPL pool formations atop the confining layer on which they settle. Cross-sectional geology (Figures 5.3.1 and 5.3.2) and knowledge of confining unit topography is very important in predicting DNAPL flow pathways.

Light NAPLs are lighter than water and float atop the groundwater table. Like DNAPLs, LNAPLs will continue to contaminate groundwater through diffusion processes until completely removed. However, LNAPLs are more easily removed than DNAPLs because of their tendency to move with changes in the groundwater surface gradient. Slight depressions can be created using pumps causing LNAPL to flow and collect in a well or other device from which the NAPL can be removed.


WEST
NBCHGDH030
NBCH017001
NBCH017003
EAST
NBCHGDH040
ELEV (FT MSL)
10
0
-10
-20
-30
-40
-50
-60
Fs
Qc
Qs
Qm
Ta
SOUTH
NBCHGDH080
NBCH017004
NBCH017001
NBCH017006
NBCH017002
NORTH
NBCHGDI160
Fs - FILL SAND AND CLAYEY SAND
Qc - QUATERNARY ORGANIC CLAY POSSIBLY SOME FILL CLAY
Qm - QUATERNARY MARSH CLAY
Qs - QUATERNARY SAND
Ta - ASHLEY FORMATION
GEOLOGIC CONTACT: DASHED WHERE INFERRED
VERT: 1" = 20'
HORIZ: 1" = 200'
VERT EXG: 10
ZONE H
CMS WORK PLAN
NAVAL BASE CHARLESTON
CHARLESTON, S.C.
FIGURE 5.3.1
SWMU 17
GEOLOGIC CROSS SECTIONS
DWG DATE 04/07/98
DWG NAME Z98030-4



VERT: 1" = 4'
HORIZ: NTS

LEGEND

▼ – FLUID LEVEL IN SUMP 09/OCT/97
▽ – APPROXIMATE GROUNDWATER LEVEL

ZONE H
CMS WORK PLAN
NAVAL BASE CHARLESTON
CHARLESTON, S.C.

FIGURE 5.3.2
SCHEMATIC CROSS SECTION
OF SWMU 17
LOOKING EAST

DWG DATE: 04/07/98 | DWG NAME: 2908B012

Soil-to-groundwater Transport and Dissolved-phase Groundwater Contamination

Fate and transport screening for SWMU 17 identified benzidine, chlorobenzene, 1,3-dichlorobenzene, 1,4-dichlorobenzene, and 1,2,4-trichlorobenzene at concentrations exceeding their fate and transport screening criteria in both soil and groundwater. Therefore, the potential exists for these compounds to migrate from soil to groundwater.

Benzidine is considered the most mobile of the above-listed contaminants in groundwater at the site and its estimated travel time to the Cooper River is approximately 180 years. Therefore, for the constituents listed above, biodegradation and volatilization are likely to be the dominant processes affecting fate and transport in the groundwater to surface water pathway rather than direct groundwater migration (e.g., mass advection).

5.3.5 Human Health Risk Assessment Summary

Surface Soil Risk Above Background

Table 5.3.1 summarizes SWMU 17 risk and hazard in excess of Zone H background.

Table 5.3.1
SWMU 17
Site Human Health Risk and Hazard above Background[1]

		Surface Soil		Shallow GW		Deep GW	
		HI[2]	ILCR[3]	HI	ILCR	HI	ILCR
SWMU 17	Res.[4]	NA	9.3E-5	79	2E-1	ND	ND
	Ind.[4]	NA	1.9E-5	12	6E-2	ND	ND

Notes:

1 – Maximum background risk in shallow surface soil =arsenic (4.1E-5 Res.; 5.8E-6 Ind.); beryllium (1.1E-5 Res.;1.5E-6 Ind.); BEQ (6.7E-6 Res.; 1.4E-6 Ind.).
Maximum background hazard shallow surface soil =arsenic (0.71 Res.; 0.04 Ind.); beryllium (0.004 Res.;0.0 Ind.); BEQ (0.0 Res.;0.0 Ind.).
Background risk and hazard has not been established for groundwater

2 – Cumulative hazard is presented as HI (hazard index). For sites with no inorganic COCs, hazard is generally not applicable.

3 – Cumulative risk is presented as ILCR (incremental lifetime cancer risk).

4 – Residential risk and hazard are for a child; Industrial risk and hazard are for an adult site worker.

NA – Site hazard is inapplicable to the organic COCs at this site.

ND – Not determined. Deep GW was not sampled during the RFI at this site.

SWMU 17 Soil - The primary risk driver in SWMU 17 soil is aroclor-1260 (9.2E-5 Res; 1.9E-5 Ind). Surface soil risk above background is shown on Figures 5.3.3 and 5.3.4.

Sample point 017-SB-020-01 accounts for nearly 70% of the site risk, and when removed, site risk drops to 2.7E-5 Residential and 5.4E-6 Industrial. With removal of the three greatest sample points (borings 017-20, 6, and 2), industrial risk drops below 1E-6. More complete surface soil risk reduction analysis is provided in Appendix A.

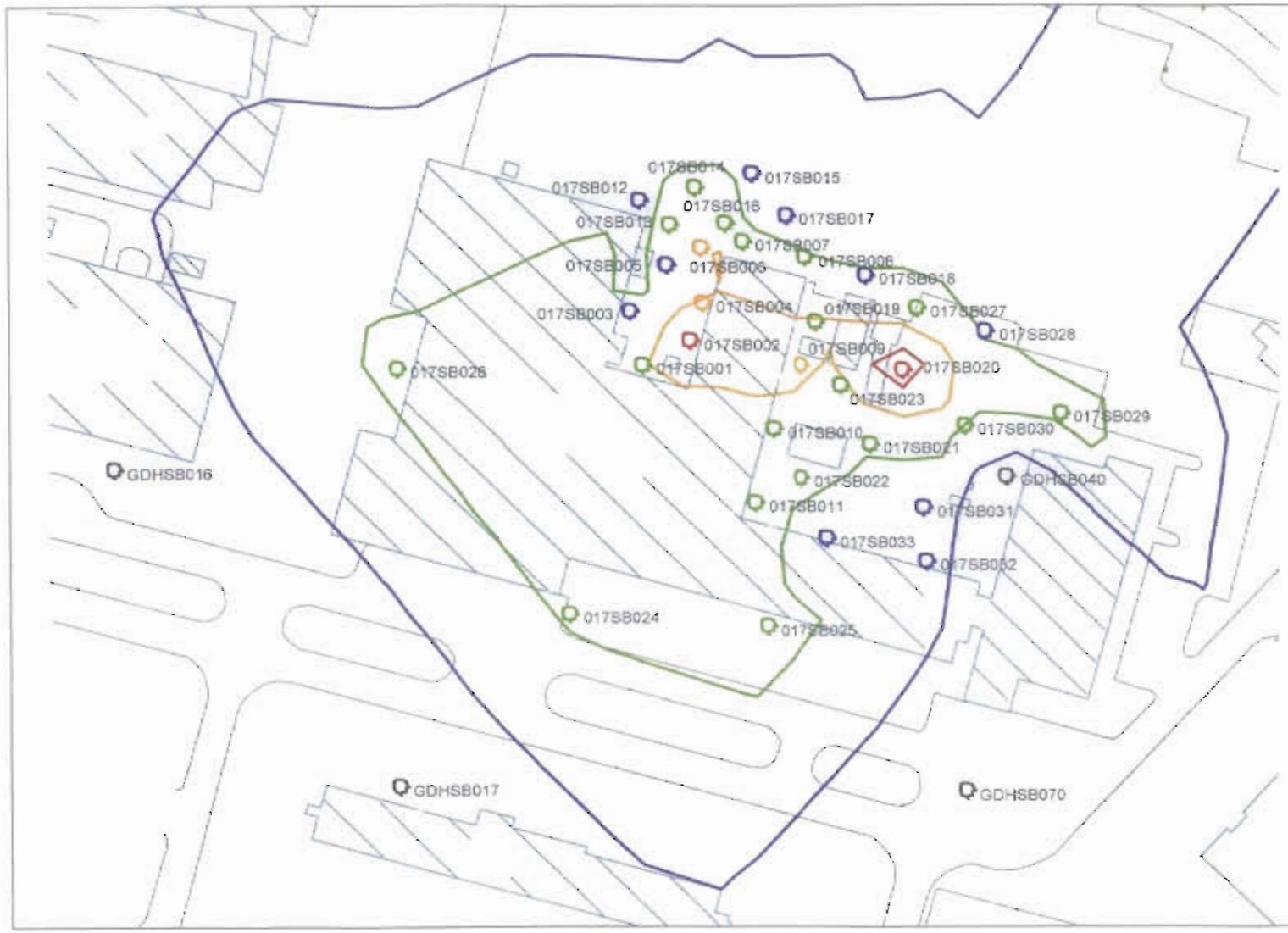
SWMU 17 Groundwater - The primary contributors to groundwater risk and hazard are benzidine and chlorinated benzenes (mono-, di-, and tri-). Aroclor-1260 was also detected at 520 μg/L in NBCH017002 during the third quarter of four rounds of sampling. Groundwater is contaminated in the area immediately surrounding NBCH017002 and appears to be slowly moving northeast, as evidenced by the lower level of contamination identified in NBCH017005.

5.3.6 Ecological Risk Assessment Summary

No ecological risk is anticipated for SWMU 17 due to lack of suitable habitat and ecological receptors.

5.3.7 Remedial Objectives

The presence of dense and light NAPL makes it highly unlikely that the shallow aquifer at SWMU 17 can be restored to before-release levels. Actions to correct dissolved-phase groundwater contamination will be ineffective until the NAPLs are removed, because NAPLs at this site represent a continuing source of dissolved groundwater contamination.



CMS WORK PLAN

Charleston Naval Base
Zone H
CHARLESTON, S.C.

Figure 5.3.3
Surface Soil Risk Above Background
Residential
SWMU 17

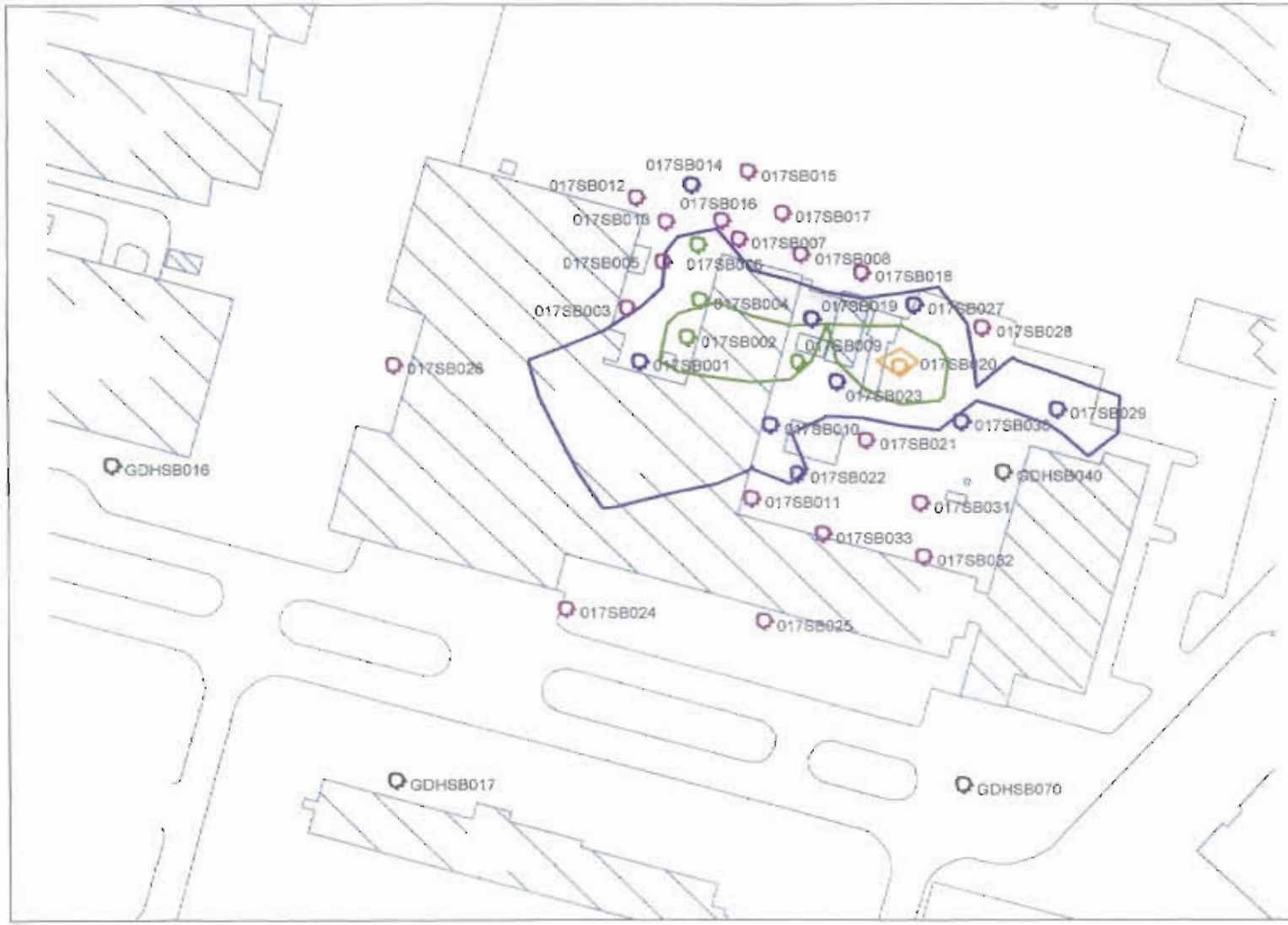
Legend
- Residential Risk > 1E-4
- Residential Risk between 1E-5 and 1E-6
- Residential Risk between 1E-6 and 1E-7
- Residential Risk below background level**
- Residential Risk between 1E-4 and 1E-5
- Residential Risk < 1E-7

**or sample was non-detect for risk drivers

- Water
- Pier
- Road
- Bldg
- Fence

N
W
E
S

1:70



CMS WORK PLAN
Charleston Naval Base
Zone H
CHARLESTON, S.C.

Figure 5.3.4
Surface Soil Risk Above Background
Industrial
SWMU 17

Legend
- Industrial Risk > 1E-4
- Industrial Risk between 1E-5 and 1E-6
- Industrial Risk between 1E-6 and 1E-7
- Industrial Risk below background**
- Industrial Risk between 1E-4 and 1E-5
- Industrial Risk < 1E-7

**or sample was non-detect for risk drivers

- Water
- Pier
- Road
- Bldg
- Fence

N
W
E
S

1:70

Therefore, the primary remedial objectives of the SWMU 17 CMS will be:

- Reduction in NAPL volume.
- Removal, capping, and/or treatment of contaminated surface soil to reduce surface soil risk to an acceptable level

5.3.8 Potential Remedial Alternatives

Proposed remedial alternative(s) for this site are:

LNAPL

- Continued passive removal of LNAPL using existing sumps
- Vacuum-enhanced recovery of LNAPL, enhanced degradation, and/or removal of vadose-zone organic contaminants using bioslurping or similar technology

DNAPL

- Manual or automated product recovery via existing monitoring wells and sumps

PCB-Impacted Soil

- Hot-spot removal outside of building and paved areas with offsite treatment/disposal
- Capping
- In-situ stabilization beneath building areas
- In-situ bioenhancement using passive or active bioventing, nutrient additions, or other applicable technology

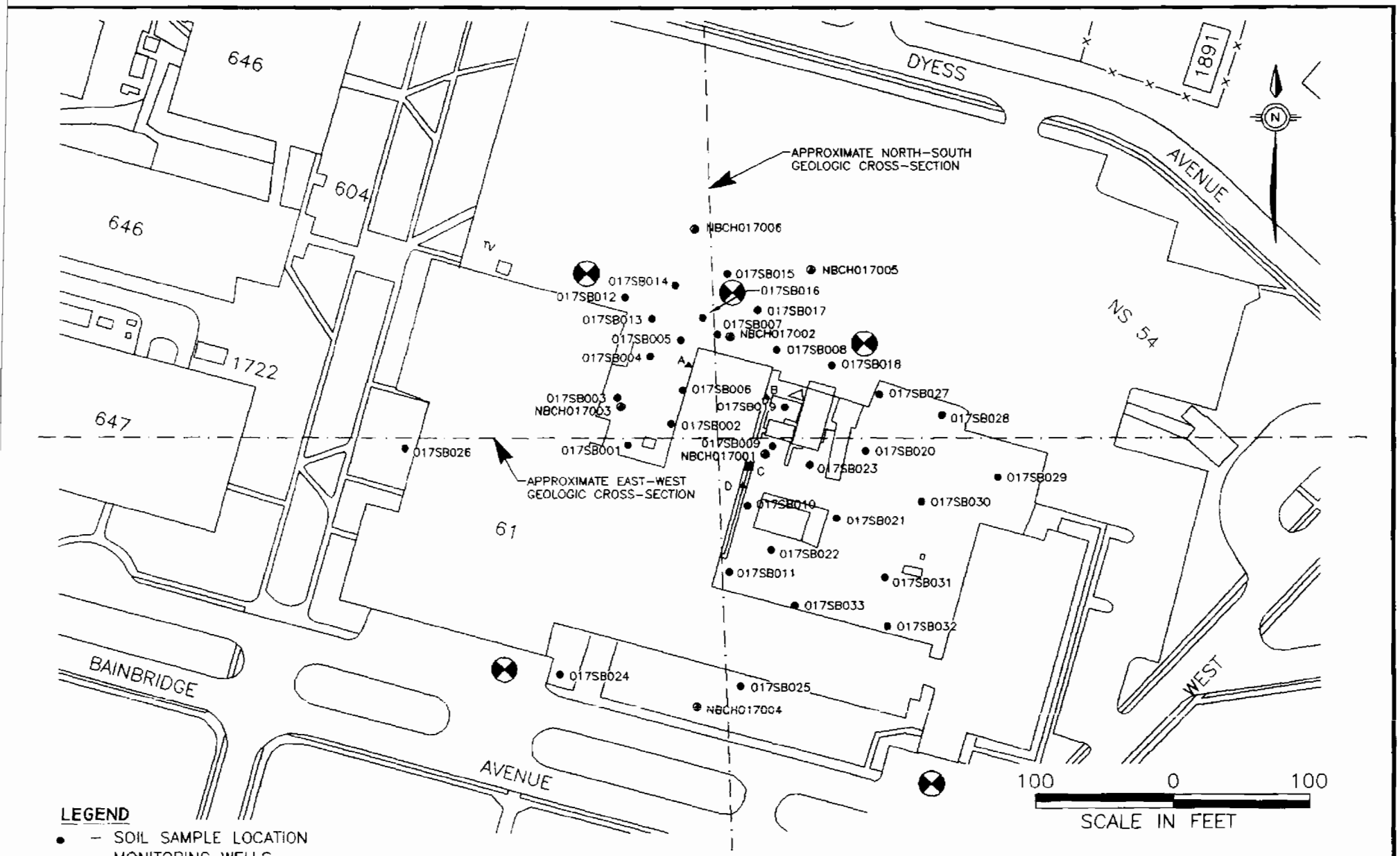
Residual Groundwater Contamination

- Long-term groundwater monitoring

5.3.9 CMS Data Needs

Based on the remedial objectives identified for SWMU 17, the following is proposed (Figure 5.3.5):

- Installation of two shallow monitoring wells near former potential PCB source areas (former silo mockup and former dive mockup) on south side of building to further evaluate potential extent of DNAPL
- Installation of two additional shallow wells near the encountered DNAPL to assess potential lateral migration of the DNAPL away from the suspected source area.
- Installation of a single deep well to assess potential DNAPL migration through the confining unit separating the deep and shallow aquifers.



LEGEND

- ● – SOIL SAMPLE LOCATION
- ● – MONITORING WELLS
- ▲ – SUMP (DRUM)
- ■ – SUMP (CONCRETE)
- ⊗ – PROPOSED LONG-TERM GROUNDWATER MONITORING WELLS (SHALLOW)
- ⊗ – PROPOSED LONG-TERM GROUNDWATER MONITORING WELL (DEEP)

ZONE H
CMS WORK PLAN
NAVAL BASE CHARLESTON
CHARLESTON, S.C.

FIGURE 5.3.5
SWMU 17
SOIL BORING, MONITORING WELL AND SUMP LOCATIONS

Date: 04/07/98 DWG Name: 2908B013

5.2 Combined SWMU 14 (Includes AOCs 670 and 684 and SWMU 15)

Combined SWMU 14 is an abandoned chemical disposal area where miscellaneous chemicals, warfare decontaminating agents, and possibly industrial wastes are reported to have been buried. The Combined SWMU 14 area encompasses SWMU 15 and AOCs 670 and 684. The discussion of nature and extent of contamination in the RFI has included all samples collected in the Combined SWMU 14 area.

Additional Sites at SWMU 14

SWMU 15 is the site of a former propane-fired incinerator reported to have been used to destroy classified documents. Only the concrete slab and concrete propane tank saddles remain. AOC 670 is a former outdoor trap and skeet range in use from approximately 1960 until the late 1970s. Lead shot and clay targets were not recovered during its operation. AOC 684 is a former outdoor pistol range that operated from the early 1960s until 1981. Firearms were discharged into a soil berm from which the spent ammunition was not recovered.

Geophysical and Soil-Gas Survey

A 1992 geophysical and soil-gas survey (E/A&H, 1994c) investigated the presence of buried containers and/or contaminant plumes in the Combined SWMU 14 area. Geophysical anomalies identified during the geophysical survey were used as a basis for subsequent RFI sampling. The geophysical and soil-gas investigation report was included in Appendix E of the Final RFI for Zone H.

Media

Soil and groundwater were sampled during the most recent investigation to identify whether contamination resulted from chemicals and other waste disposal in the Combined SWMU 14 area and whether residual chemical contamination resulted from small arms activity nearby. Because the investigation focused on residual chemicals, surface soil was not mechanically screened to

determine approximate quantities and type of residual lead shot material remaining at the pistol and skeet ranges. Three media will be addressed during the CMS: soil, groundwater, and lead shot in soil.

Most of the significant contamination detected in soil samples collected during the RFI at Combined SWMU 14 was apparently related to the former incinerator (SWMU 15) and the former skeet range (AOC 670).

DANC

Canisters of decontaminating agent non-corrosive (DANC) and other items buried in the Combined SWMU 14 area were not identified during the RFI and the chemical data for soil and groundwater samples collected in the area did not suggest that a release had occurred. DANC was developed prior to World War II and its primary constituent is acetylene tetrachloride, a toxic chlorinated organic solvent. Because recent interim measures resulted in the excavation of DANC containers, the CMS will re-investigate potentially impacted groundwater near the unearthed DANC containers.

5.2.1 Current Use

The Combined SWMU 14 site is not currently used by either federal or nonfederal base tenants.

5.2.2 Future Use

According to the Charleston Naval Complex Redevelopment Authority, this area will likely be used for industrial purposes in the future.

5.2.3 ISM Status

The Navy DET has completed a series of additional geophysical surveys at the subject site and is currently excavating soil in anomalous areas. The remains of 5-gallon cans containing DANC have been unearthed at Combined SWMU 14 in an area directly south of Building 1897. The cans were deteriorated and dry granulated DANC residue was visually identified on their remains. Surface water grab samples collected within the pit contained PCA (92.4 ug/L), TCE (85 ug/L), DCE (166 ug/L 1,2-cis-DCE; 29.4 1,2-trans-DCE), and Vinyl Chloride (26.0 ug/L).

5.2.4 Fate and Transport Summary

To evaluate fate and transport, constituents detected in Combined SWMU 14 groundwater were compared to the constituents detected in soil samples from SWMUs 14 and 15 and AOCs 670 and 684. Maximum concentrations in groundwater and soil were compared to relevant fate and transport screening criteria to highlight potential migration pathways. Chromium and lead were identified as constituents with a potential for soil-to-groundwater migration.

Lead was detected in groundwater in three wells at SWMU 14; however, groundwater concentrations of lead only exceeded its MCL of 15 μg/L in one well (NBCH014001) during one sampling event. All four quarters of lead results are listed in Table 5.2.1 for the three wells where lead was detected.

In addition, shallow groundwater migration in Zone H is characterized by low hydraulic gradients. A travel time of 200 to 300 years was estimated for groundwater to migrate from Combined SWMU 14 area to the Cooper River, the nearest surface water. Therefore, sorption is likely to be the dominant process affecting fate and transport, rather than groundwater migration for lead and chromium.

Table 5.2.1
Combined SWMU 14
(µg/L lead)

Well	1st Qtr.	2nd Qtr.	3rd Qtr.	4th Qtr.
NBCH014001	2.6	19.7	2.2	ND
NBCH014005	5	ND	ND	ND
NBCH014005D	8.3	ND	ND	ND

Note:
ND = non-detect

Qualitative evaluation of the surface soil to sediment migration pathway provided evidence that erosion may be an issue for AOCs 670 and 684. Many constituents detected in surface soil were also detected in sediment from a drainage ditch that separates Buildings 1887, 1893, and 1897 from Buildings 1984 and 1888. This ditch appears to be an intermittent-flow ditch because it contains water primarily during the seasonal rainy period. The ditch drains north about 250 feet, at which point it stops behind (west) of SWMU 138 and AOC 667 (former vehicle storage and maintenance area). However, this drainage ditch does not act as habitat or a headwater for any known ecologically-sensitive area at the former naval base and therefore it is not a concern at Combined SWMU 14.

No other significant fate and transport issues were identified at Combined SWMU 14.

5.2.5 Human Health Risk Assessment Summary

Surface Soil Risk Above Background

Table 5.1.2 summarizes background study results for Zone H in terms of surface soil risk and hazard. Where applicable, these values were subtracted from each compound's contribution to total site surface soil risk and hazard. Table 5.2.2 summarizes Combined SWMU 14 risk and

hazard in excess of Zone H background. The following subsections interpret these results in terms of future CMS activities.

Table 5.2.2
Combined SWMU 14
Site Human Health Risk and Hazard above Background[1]

		Surface Soil		Shallow GW		Deep GW	
		HI[2]	ILCR[3]	HI	ILCR	HI	ILCR
SWMU 14 (combined)	Res.[4]	0.17	2.3E-5	1.6	2.9E-5	17	5E-4
	Ind.[4]	0.02	4.7E-6	0.3	6.8E-6	3	1E-4

Notes:

1 — Maximum background risk in shallow surface soil =arsenic (4.1E-5 Res.; 5.8E-6 Ind.); beryllium (1.1E-5 Res.;1.5E-6 Ind.); BEQ (6.7E-6 Res.; 1.4E-6 Ind.).
Maximum background hazard shallow surface soil =arsenic (0.71 Res.; 0.04 Ind.); beryllium (0.004 Res.;0.0 Ind.); BEQ (0.0 Res.;0.0 Ind.).
Background risk and hazard has not been established for groundwater

2 — Cumulative hazard is presented as HI (hazard index). For sites with no inorganic COCs, hazard is generally not applicable.

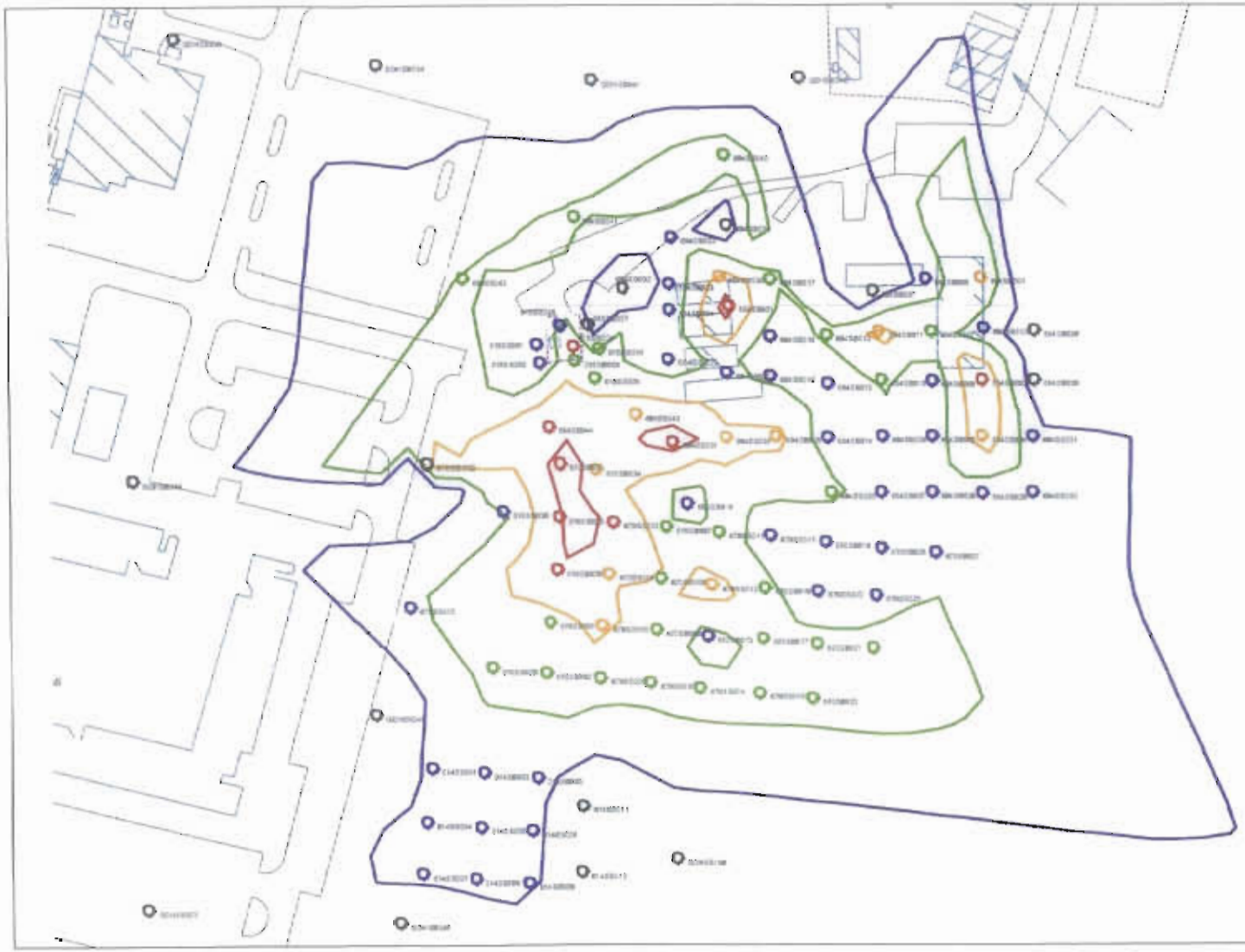
3 — Cumulative risk is presented as ILCR (incremental lifetime cancer risk).

4 — Residential risk and hazard are for a child; Industrial risk and hazard are for an adult site worker.

NA — Not applicable.

Combined SWMU 14 Soil - The primary risk driver in Combined SWMU 14 soil is BEQs (2.3E-5 Res; 4.6E-6 Ind). Surface soil risk above background is shown on Figures 5.2.1 and 5.2.2. Note that residual surface soil risk under an industrial scenario would be only 4.7E-6.

Combined SWMU 14 Groundwater - The primary residential risk drivers for shallow groundwater are bis[2-ethylhexyl]phthalate (BEHP) and 2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD) equivalents. However, these two constituents were identified in first quarter sampling only and did not exceed their MCL, background, or tap water risk-based concentration (RBC) during the remaining three quarters of groundwater sampling.



CMS WORK PLAN

Charleston Naval Base
Zone H
CHARLESTON, S.C.

Figure 5.2.1
Surface Soil Risk Above Background
Residential
SWMU 14

Legend
- Residential Risk > 1E-4
- Residential Risk between 1E-5 and 1E-6
- Residential Risk between 1E-6 and 1E-7
- Residential Risk below background level**
- Residential Risk between 1E-4 and 1E-5
- Residential Risk < 1E-7

**or sample was non-detect for risk drivers

- Water
- Pier
- Road
- Bldg
- Fence

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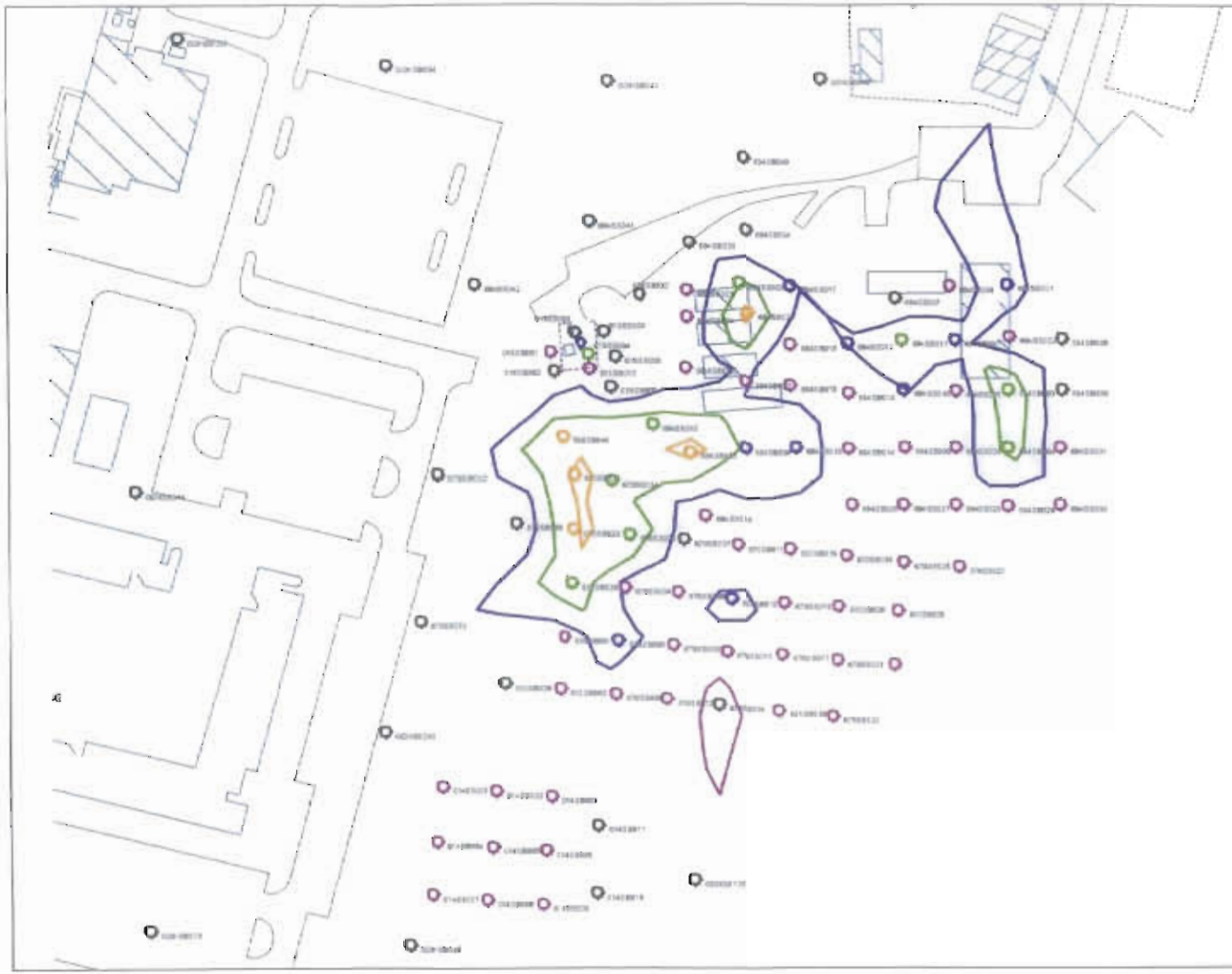
1:100



CMS WORK PLAN
Charleston Naval Base
Zone H
CHARLESTON, S.C.

Figure 5.2.2
Surface Soil Risk Above Background
Industrial
SWMU 14

Legend
- Industrial Risk > 1E-4
- Industrial Risk between 1E-5 and 1E-6
- Industrial Risk between 1E-6 and 1E-7
- Industrial Risk below background**
- Industrial Risk between 1E-4 and 1E-5
- Industrial Risk < 1E-7

**or sample was non-detect for risk drivers

- Water
- Pier
- Road
- Bldg
- Fence

N
W
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1:100

The primary residential risk drivers for deep groundwater are BEHP, 2,3,7,8-TCDD equivalents, and heptachlor epoxide. However, two of these constituents, BEHP and the dioxin, did not exceed their MCL, background, or tap water RBC during four quarters of groundwater sampling. The third constituent, heptachlor epoxide, exceeded its MCL (0.20 ug/L) in only one well (NBCH01403D). Heptachlor epoxide concentrations in NBCH01403D were 3.24, ND, ND, and ND (units of μg/L and ND is non-detect) over 4 quarters of sampling.

Quarterly groundwater sampling results for SWMU 14 are shown on Figures 5.2.3 and 5.2.4.

5.2.6 Ecological Risk Assessment Summary

Based on the ecological risk assessment completed during the RFI, no ecological concerns are significant at Combined SWMU 14 (Ecological Subzone H-3). The primary ecological risk drivers are lead, arsenic, and low but widespread concentrations of BEQ compounds (refer to Figures 7.11 and 7.12 of the RFI).

A single sample point (670SB023) out of 60 drove an unacceptable risk level for the short-tailed shrew (Figure 7.11 of the RFI). This sample point contained lead at 20,900 mg/kg versus the risk screening level (e.g., short-tailed shrew lethal threshold) of 8,000 mg/kg. This sample would need to have contained lead shot or some other form of pure lead source to produce this type of concentration and may be considered anomalous given prevailing site conditions.

Only two sample points (015SB004 and 670SB023) out of 60 drove an unacceptable risk level for the indigenous rabbit. These sample points contained approximately 60 mg/kg of arsenic versus the risk screening level (e.g., indigenous rabbit sublethal threshold) of 27 mg/kg. These samples are separated by approximately 700 feet and surrounded by sampling points not posing unacceptable ecological risks.

5.2.7 Remedial Objectives

Review of recently provided DET interim measure reports for the Combined SWMU 14 area indicate that site risk from surface soil is about 2.3E-5 under the residential scenario and only 4.7E-6 above background under an industrial scenario.

Grab samples of water in the base of the DANC container excavation pit contained concentrations of chlorinated solvents in excess of their MCLs.

Therefore, the following remedial objectives are proposed for Combined SWMU 14:

- Removal/recovery of any significant amounts of lead shot found in surface soil
- Pending a risk management decision as to an acceptable level of residual risk, remedial activities may be needed to reduce the amount of risk posed by site surface soils to acceptable levels above background
- Assessment of groundwater in area of DANC containers to determine potential impacts

The establishment of a final groundwater remedial objective will depend on the results of the groundwater assessment to be completed in the CMS.

5.2.8 Potential Remedial Alternatives

Proposed remedial alternative(s) for this site include:

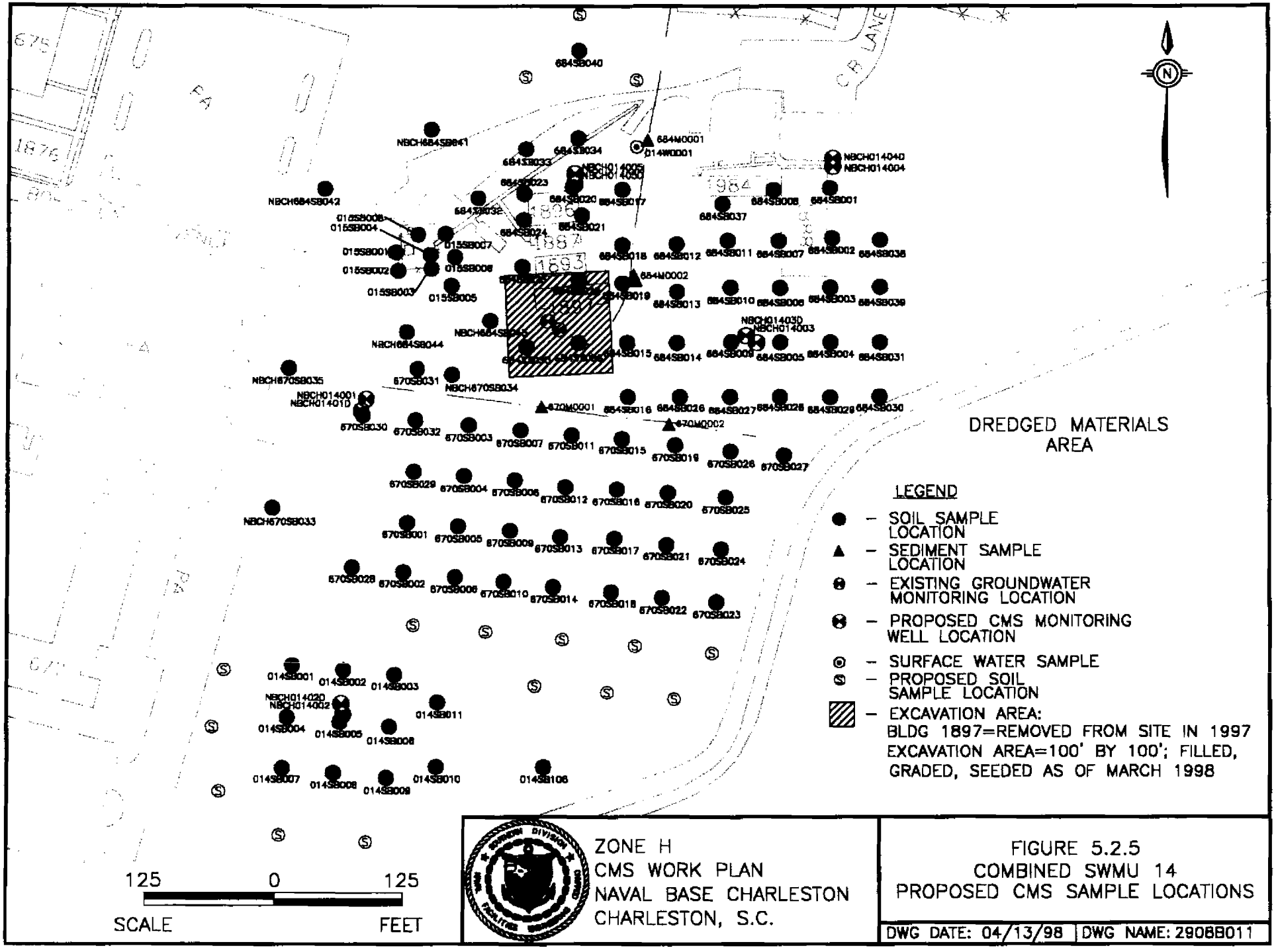
- If particulate lead is determined to be a remedial concern during the CMS, excavation of lead-shot-impacted soil followed by lead-particle separation from soil matrix and subsequent recovery/reuse of lead material or acid leaching treatment for excavated soil and/or direct disposal of soil into landfill and/or direct soil placement back into Combined SWMU 14.

- Capping and/or hot spot excavation of soils to reduce surface soil risk to acceptable levels.
- In-situ stabilization to decrease mobility and/or solubility of surface soil COCs.
- Short-term groundwater monitoring (e.g., two quarters) to confirm or refute the presence of acetylene tetrachloride and like compounds in the area of the DANC container excavation, and to determine if remedial action is required.

5.2.9 CMS Data Needs

Based on the remedial objectives identified for Combined SWMU 14, the following activities are proposed (Figure 5.2.5):

- Conduct additional sampling to estimate area/volume of lead-shot-impacted soil and determine lead distribution by particle size (If significant quantities of lead shot are identified during the additional sampling activity, review Department of Defense Range Rule for site applicability).
- Construct and sample a nested groundwater monitoring well pair (shallow/deep wells) in area of DANC container excavation.
- If sample results confirm the presence of chlorinated solvents above MCLs, construct up to 3 additional monitoring wells and perform sampling and slug-testing to characterize the plume and local aquifer conductivity.


DREDGED MATERIALS AREA
LEGEND
● – SOIL SAMPLE LOCATION
▲ – SEDIMENT SAMPLE LOCATION
– EXISTING GROUNDWATER MONITORING LOCATION
– PROPOSED CMS MONITORING WELL LOCATION
– SURFACE WATER SAMPLE
– PROPOSED SOIL SAMPLE LOCATION
– EXCAVATION AREA:
BLDG 1897=REMOVED FROM SITE IN 1997
EXCAVATION AREA=100' BY 100'; FILLED, GRADED, SEEDED AS OF MARCH 1998
125 0 125
SCALE FEET
ZONE H
CMS WORK PLAN
NAVAL BASE CHARLESTON
CHARLESTON, S.C.
FIGURE 5.2.5
COMBINED SWMU 14
PROPOSED CMS SAMPLE LOCATIONS
DWG DATE: 04/13/98
DWG NAME: 2908B011

5.4 SWMU 136 and AOC 663

SWMU 136 is a former Satellite Accumulation Area (SAA) that received hazardous waste from nearby Buildings 851 and NS53. AOC 663 is a former diesel pumping station at Building 851. Two 500-gallon USTs have recently been removed from the subject site. Five flammable storage lockers were also located along the pumping station's east side.

Soil and groundwater were sampled at this site to determine if contamination resulted from diesel fuel storage and dispensing from the USTs or other releases at the site.

5.4.1 Current Use

Building NS53 is presently occupied by a nonfederal tenant. The fenced parking lot adjacent to the pump station is currently being used by the NS53 tenant for storage of boats and miscellaneous materials.

5.4.2 Future Use

According to the Charleston Naval Complex Redevelopment Authority, this area will likely be used for industrial purposes in the future, which is consistent with its current use.

5.4.3 ISM Status

The Navy DET has recently removed the two 500-gallon USTs near Building 851. The results of the Navy DET ISM at the site will be reviewed by EnSafe and considered during the CMS process.

5.4.4 Fate and Transport Summary

The possibility of SWMU 136 and AOC 663 soil to groundwater, groundwater to surface water and soil to air cross-media transport was evaluated during the RFI. None of these contaminant transport routes was considered to be a concern for this site.

5.4.5 Human Health Risk Assessment Summary

Surface Soil Risk Above Background

Table 5.4.1 summarizes SWMU 136/ AOC 663 total groundwater risk and hazard and soil risk and hazard in excess of Zone H background.

Table 5.4.1
Combined SWMU 136/ AOC 663
Site Human Health Risk and Hazard above Background[1]

		Surface Soil		Shallow GW		Deep GW	
		HI[2]	ILCR[3]	HI	ILCR	HI	ILCR
SWMU 136/ AOC 663	Res.[4]	0.3	3.4E-5	6	7E-5	ND	ND
	Ind.[4]	0.06	6.6E-6	1	2E-5	ND	ND

Notes:

1 – Maximum background risk in shallow surface soil =arsenic (4.1E-5 Res.; 5.8E-6 Ind.); beryllium (1.1E-5 Res.;1.5E-6 Ind.); BEQ (6.7E-6 Res.; 1.4E-6 Ind.).
Maximum background hazard shallow surface soil =arsenic (0.71 Res.; 0.04 Ind.); beryllium (0.004 Res.;0.0 Ind.); BEQ (0.0 Res.;0.0 Ind.).
Background risk and hazard has not been established for groundwater

2 – Cumulative hazard is presented as HI (hazard index). For sites with no inorganic COCs, hazard is generally not applicable.

3 – Cumulative risk is presented as ILCR (incremental lifetime cancer risk).

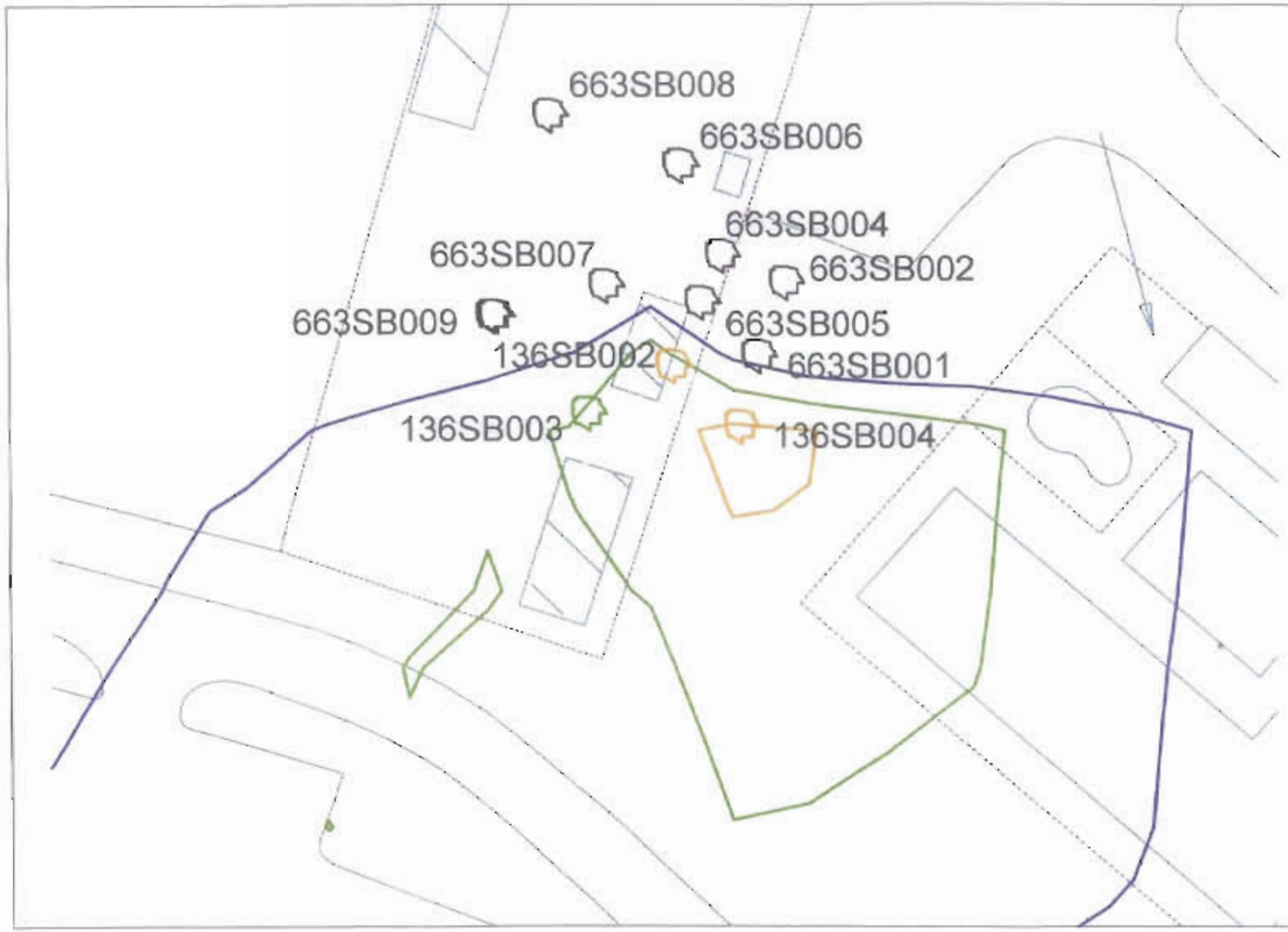
4 – Residential risk and hazard are for a child; Industrial risk and hazard are for an adult site worker.

NA – Site hazard is inapplicable to the organic COCs at this site.

ND – Not determined. Deep GW was not sampled during the RFI at this site.

SWMU 136/ AOC 663 Soil - The primary risk driver in soils are BEQs (2.4E-5 Res; 4.8E-6 Ind), and arsenic (5.5E-6 Res; 0.8E-6 Ind). Surface soil risk above background is shown on Figures 5.4.1 and 5.4.2.

The majority of sample points with risk above background are located within a gravel parking/ storage area which could easily be paved. If the single sample point contributing the most risk (663-SB-07) were removed or capped with pavement, site risk would drop to 1.9E-5 residential and 3.3E-6 industrial. Industrial site risk above background drops below 1E-6 after removal of



CMS WORK PLAN
Charleston Naval Base
Zone H
CHARLESTON, S.C.

Figure 5.4.1
Surface Soil Risk Above Background
Residential
SWMU 136/AOC 663

Legend
- Residential Risk > 1E-4
- Residential Risk between 1E-5 and 1E-6
- Residential Risk between 1E-6 and 1E-7
- Residential Risk below background level**
- Residential Risk between 1E-4 and 1E-5
- Residential Risk < 1E-7

** or sample was non-detect for risk drivers

- Water
- Pier
- Road
- Bldg
- Fence

N
W
E
S

1:35

CMS WORK PLAN
Charleston Naval Base
Zone H
CHARLESTON, S.C.

Figure 5.4.2
Surface Soil Risk Above Background
Industrial
SWMU 136/AOC 663

Legend
- Industrial Risk > 1E-4
- Industrial Risk between 1E-5 and 1E-6
- Industrial Risk between 1E-6 and 1E-7
- Industrial Risk below background**
- Industrial Risk between 1E-4 and 1E-5
- Industrial Risk < 1E-7

** or sample was non-detect for risk drivers
- Water
- Pier
- Road
- Bldg
- Fence

N
W E
S

1:35

the 4 greatest risk points (663-SB-07 and -04 and 136-SB-04 and 02), and residential site risk would drop below 1E-6 if the parking/storage area were paved.

The primary contributors to groundwater risk and hazard are benzene (7E-5 Res; 1.7E-5 Ind) at NBCH663002 and 2,3,7,8-TCDD (3E-6 Res; 7E-7 Ind) equivalents at NBCH663001. However, the TCDD equivalents did not exceed their MCL of 3E-8 mg/L and were identified in only one of three site wells and only during the first quarter of sampling. Table 5.4.2 shows four quarters of benzene concentrations (MCL = 5 μg/L) from NBCH663001.

Table 5.4.2
SWMU 663 and AOC 136
(μg/L benzene)

Well	1st Qtr.	2nd Qtr.	3rd Qtr.	4th Qtr.
NBCH663001	ND	160	13	3

Note:
ND = non-detect

5.4.6 Ecological Risk Assessment Summary

No ecological risk is anticipated for SWMU 136 and AOC 663 due to lack of suitable habitat and ecological receptors.

5.4.7 Remedial Objectives

The project team has requested that SWMU 136 and AOC 663 be placed in the CMS process due to arsenic in surface soil and benzene in groundwater. SCDHEC requested that SVOCs be added to the groundwater sampling suite for future rounds to check for the presence of BEHP contamination.

Therefore, CMS objectives for this site include:

- Further delineate the extent of arsenic contamination in soils in unpaved areas of the site and assess the need for any additional soil remediation based on the results
- Monitor for the presence of benzene, BEHP and other organic compounds in existing groundwater well NBCH-663-001
- Transfer this site to the UST program, if possible.

5.4.8 Potential Remedial Alternatives

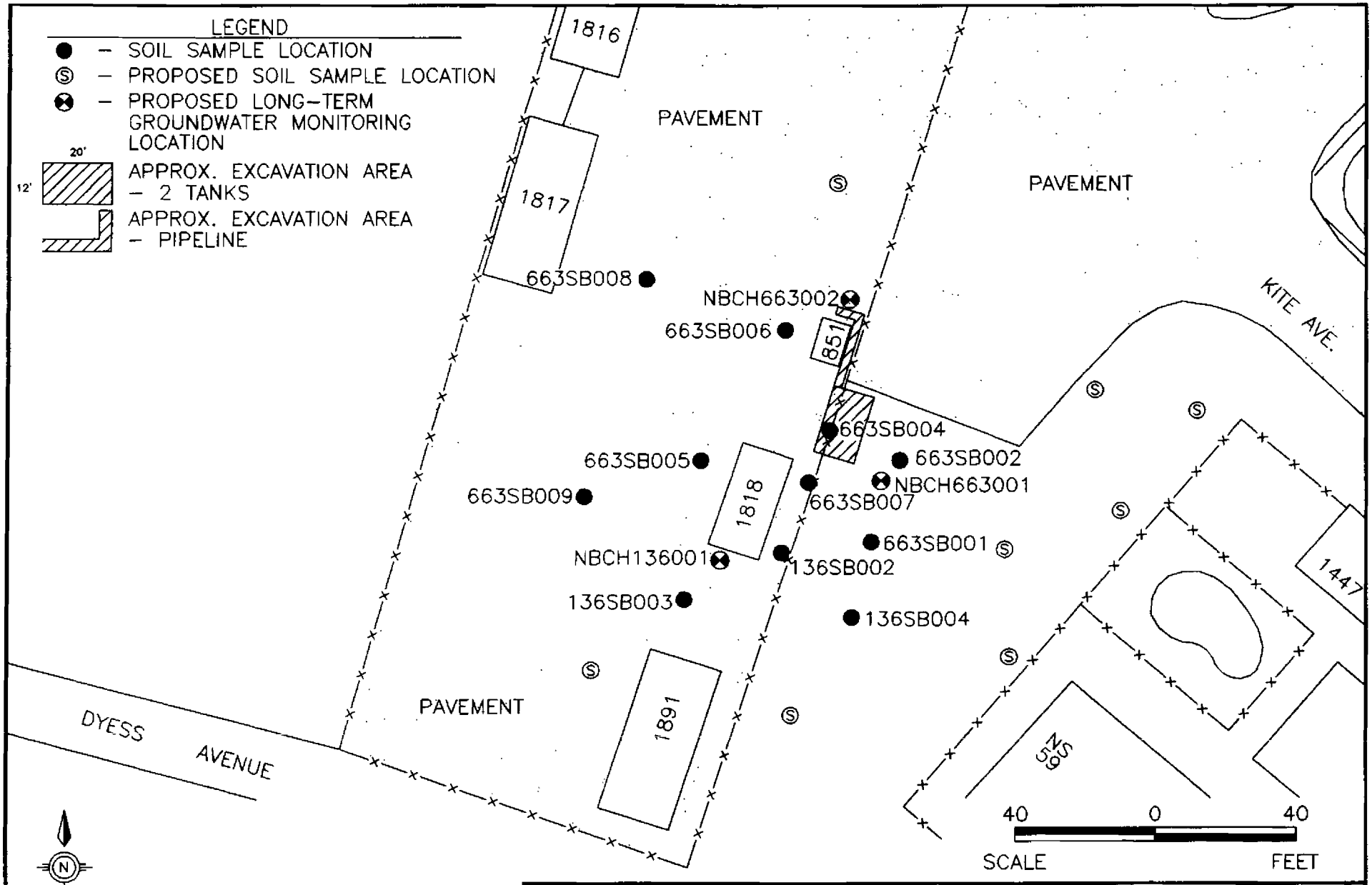
Based on the project team's concern pertaining to surface soil arsenic and benzene in groundwater, the proposed remedial alternative(s) for this site include:

- Excavation with offsite disposal
- Paving/capping of exposed soil areas
- Additional short-term groundwater monitoring (e.g., two quarters) to confirm or refute the presence of benzene and to determine if remedial action is required

5.4.9 CMS Data Needs

Based on the project team's concern pertaining to surface soil arsenic and benzene in groundwater, the following activities are proposed (Figure 5.4.3):

- Additional borings at the site to further delineate surface soil that significantly exceeds background risk
- Sampling and analysis of site groundwater for VOCs and SVOCs using three existing site monitoring wells and two wells from nearby SWMU 178


LEGEND
● – SOIL SAMPLE LOCATION
Ⓢ – PROPOSED SOIL SAMPLE LOCATION
– PROPOSED LONG–TERM GROUNDWATER MONITORING LOCATION
20'
12'
APPROX. EXCAVATION AREA – 2 TANKS
APPROX. EXCAVATION AREA – PIPELINE
1816
1817
1818
1891
851
1447
PAVEMENT
PAVEMENT
PAVEMENT
663SB008
NBCH663002
663SB006
663SB004
663SB005
663SB002
NBCH663001
663SB009
663SB007
663SB001
NBCH136001
136SB002
136SB003
136SB004
KITE AVE.
DYESS AVENUE
N 59°
40 0 40
SCALE FEET
N
ZONE H
CMS WORK PLAN
NAVAL BASE CHARLESTON
CHARLESTON, S.C.
FIGURE 5.4.3
AOC 663 & SWMU 136
PROPOSED CMS SAMPLE LOCATION
LOCATION MAP
DWG DATE: 04/08/98
DWG NAME: 2908G001

5.5 SWMU 159

SWMU 159 is south of Building 665 (the former base commissary) in the south-central portion of Zone H. The former SAA was used to temporarily accumulate and store hazardous materials such as batteries, aerosol cans, and paint waste. An aboveground storage tank containing diesel fuel, a can crusher, and small debris piles were also at the unit.

Soil, sediment, and surface water were sampled to assess any residual contamination from the former storage area.

5.5.1 Current Use

The SWMU 159 site is not currently used by either federal or nonfederal tenants.

5.5.2 Future Use

According to the Charleston Naval Complex Redevelopment Authority, this area will likely be used for industrial purposes in the future, provided development is not overly restricted by current site conditions or limitations imposed by potential remedial alternatives. However, a tidal marsh area adjacent to SWMU 159 could limit potential development through wetland permitting restrictions. A request for development of a wetland area would require the potential site reusers to fulfill the appropriate permitting requirements. Typically, the U.S. Army Corps of Engineers is the regulatory agency responsible for wetland permitting.

5.5.3 ISM Status

The Navy DET has recently removed and disposed of soil from the subject site. The results of the Navy DET ISM at the site will be reviewed by EnSafe and considered during the CMS process.

5.5.4 Fate and Transport Summary

The possibility of SWMU 159 soil to groundwater, surface soil to sediment/surface water and soil to air cross-media transport was evaluated during the RFI. The soil to groundwater and soil to air cross-media transport routes were not considered to be a concern for this site. However, a comparison of contaminants detected in both media in the surface soil to sediment migration pathway provided evidence of erosion at SWMU 159.

5.5.5 Human Health Risk Assessment Summary

Surface soil risk above background is less than 1E-06. Although many constituents detected in surface soil were also detected in adjacent marsh area sediments, RFI risk assessment results show that site erosion and impacted sediments do not pose an unacceptable risk to sensitive receptors (e.g., potential adolescent trespassers) at SWMU 159.

No groundwater samples were collected to assess groundwater risk at this site.

5.5.6 Ecological Risk Assessment Summary

Inorganics in two sediment samples posed potential risk to the ecological community. However, soils surrounding both sample points (159M0001 and 159M0002) have been excavated by the Navy DET.

5.5.7 Remedial Objectives

Current site risk above background from surface soil is below 1E-6 under both residential and industrial scenarios. Therefore, site soils do not require active or passive remedial attention.

The project team has requested that SWMU 159 be placed in the CMS process due to potential groundwater concerns. Trichloroethene was detected in 14 of 16 surface soil samples at concentrations ranging from 3.3 to 21 μg/kg and in two of three subsurface soil samples at

concentrations ranging from 9 to 20 µg/kg. However, the maximum concentration of trichloroethene is more than three orders of magnitude less than the risk-based screening level of 47,000 µg/kg and approximately equal to the soil-to-groundwater screening level of 20 µg/kg.

5.5.8 Potential Remedial Alternatives

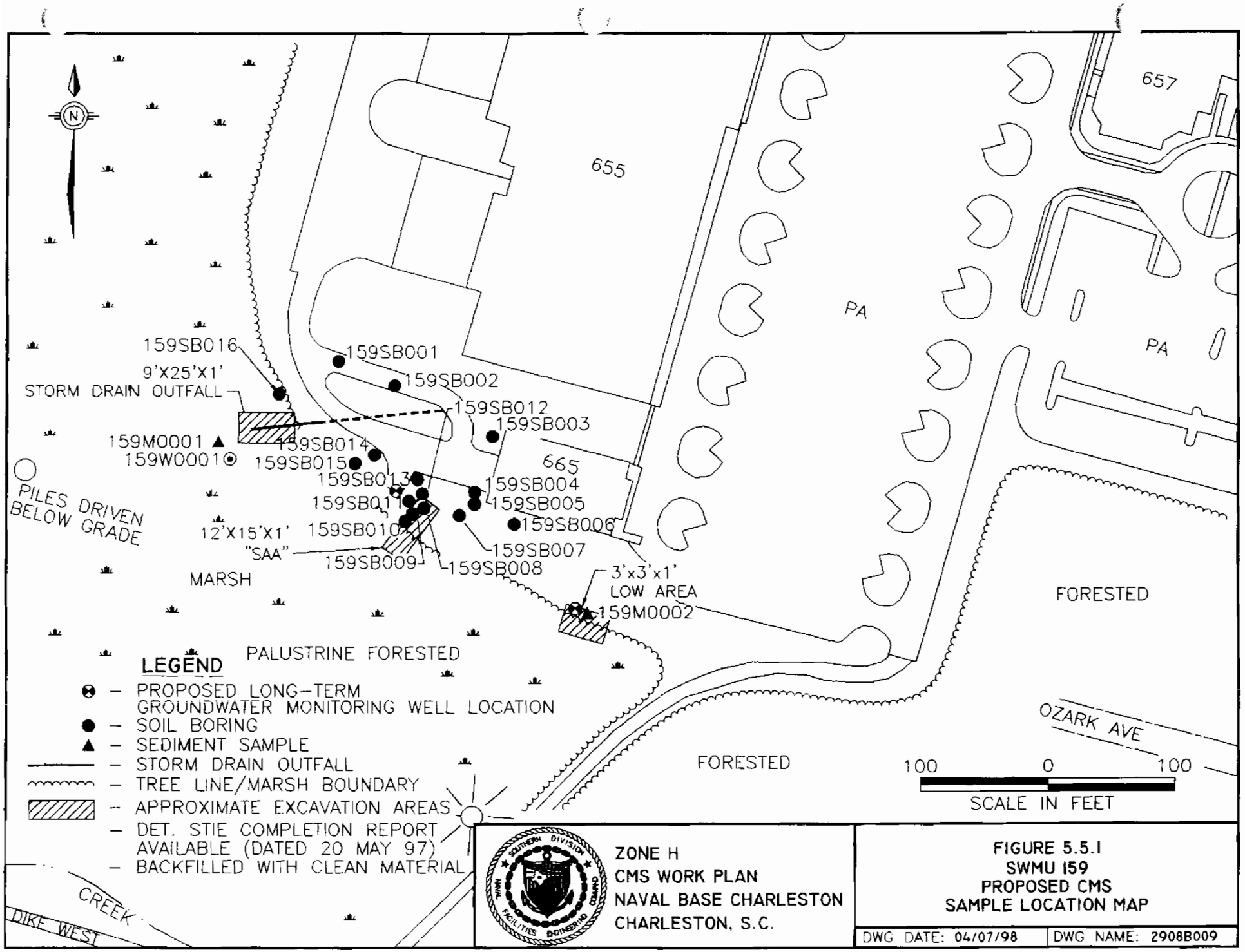
Based on the project team's concern pertaining to potential trichloroethene in groundwater, the proposed remedial alternative(s) for this site are:

- Short-term groundwater monitoring (e.g., two quarters) to confirm or refute the presence of chlorinated solvent compounds and to determine if remedial action is required

5.5.9 CMS Data Needs

Based on the project team's concern about potential trichloroethene in groundwater, the following activities are proposed (Figure 5.5.1):

- Construction and sampling of two groundwater monitoring wells at the site in the area of greatest potential for trichloroethene identification
- Obtain and review DET soil excavation and confirmation sampling results



ZONE H
CMS WORK PLAN
NAVAL BASE CHARLESTON
CHARLESTON, S.C.

FIGURE 5.5.1
SWMU 159
PROPOSED CMS
SAMPLE LOCATION MAP

DWG DATE: 04/07/98 | DWG NAME: 2908B009

5.6 AOC 503

AOC 503 is an unexploded ordnance (UXO) area south of SWMU 159 and the former base commissary. Two Mark-17 depth bombs were reportedly jettisoned in this area from a naval aircraft in 1943. The site is in a wooded and wetland-type area adjacent to a gravel road that connects the former base commissary parking lot to West Road, a gravel perimeter road near Shipyard Creek.

5.6.1 Current Use

Because AOC 503 remains undeveloped, it is not in use.

5.6.2 Future Use

According to the Charleston Naval Complex Redevelopment Authority, this area will likely be used for industrial purposes, if it can be developed in the future; otherwise, it will most likely remain an undeveloped marsh area. Redeveloping a wetland area would require the U.S. Navy to fulfill the appropriate permitting requirements. Typically, the U.S. Army Corps of Engineers is the regulatory agency responsible for wetland permitting.

5.6.3 ISM Status

The Navy Explosives Ordnance Disposal (EOD) Team has recently investigated the site through several means and has not identified adequate physical evidence of unexploded ordnance. The results of the Navy EOD Team ISM at the site will be reviewed by EnSafe and considered during the CMS process.

5.6.4 Fate and Transport Summary

An RFI has not been completed at AOC 503; therefore contaminant fate and transport study results are not applicable or available.

5.6.5 Human Health Risk Assessment Summary

Because an RFI has not been completed at AOC 503, human health risk assessment results based on potential chemical contamination are not applicable or available.

5.6.6 Ecological Risk Assessment Summary

An RFI has not been completed at AOC 503; therefore ecological risk assessment study results based on potential chemical contamination are not applicable or available. However, AOC 503 is within a designated ecological subzone (referred to as H-2 in the Zone H RFI), which was previously discussed in Section 5.1.

5.6.7 Remedial Objectives

Remedial objectives for AOC 503 should be based on potential risks to human beings caused by *physical* hazards versus the potential risks caused by *chemical* hazards. The distinction between these two hazards is identified below:

- Physical hazard — an uncontrolled detonation from the two depth charges
- Chemical hazard — chemical contamination of surrounding media resulting from the two depth charges deteriorating over time in the environment

It is obvious that the physical hazard can be life-threatening whereas any chemical hazard, would likely pose much less risk to human or ecological receptors. Therefore, the site investigation and establishment of remedial goals for AOC 503 should be based on the potential for physical hazards (e.g., uncontrolled detonation) versus chemical risk. Furthermore, although no physical evidence of unexploded ordnance was identified by the Navy EOD Team, the safety risks to site personnel completing soil borings and/or constructing groundwater monitoring wells at this UXO site far outweigh any benefits that may be obtained by sampling and analyzing the soil and/or groundwater for chemical constituents.

The most significant threat at this site is the potential that two depth bombs have yet to be identified. The risks to human health and the environment from a buried bomb deteriorating over time are minor compared to the overall safety risks associated with an uncontrolled detonation of two depth charges that may still be somewhere near AOC 503.

Based on current site conditions, Navy EOD Team activities, reuse considerations, wetland constraints, and development restrictions for AOC 503, the primary remedial objective of protecting human health and the environment easily can be met by placing institutional controls and possibly deed restrictions on an approximate 4 to 8 acre parcel of property considered a tidal marsh.

Even though the two depth charges were not identified during the Navy EOD Team investigation, the project team has requested that AOC 503 be placed in the CMS process due to concerns about the potential for groundwater to be chemically contaminated by two physically deteriorating depth charges that may still be near the site.

5.6.8 Potential Remedial Alternatives

Based on the project team's concern about potential chemical contamination of site groundwater, proposed remedial alternative(s) for this site are:

- Institutional controls
- Short-term groundwater monitoring (e.g., two more quarters) of an existing monitoring well pair to confirm or refute the presence of pyrotechnic-type compounds and to determine if remedial action is required

5.6.9 CMS Data Needs

Based on the project team's concern about potential chemical contamination of site groundwater, the following activities are proposed:

- Sampling of existing and nearby grid well pair NBCHGRD11 and NBCHGRD11D
- Analysis of groundwater samples for VOCs and pyrotechnic constituents via USEPA Method 8330

The proposed laboratory method can determine 14 different pyrotechnic-type compounds such as cyclonite (RDX), trinitrotoluene (TNT), and dinitrotoluene (DNT).

5.7 AOC 653

AOC 653 is a former hydraulic fluid storage tank at the west end of Building 1508, one of the four buildings that made up the former automotive hobby shop complex. The use of this tank was initially discontinued due to suspected leakage. The tank was later physically removed from the site by the Navy DET during an ISM.

Soil and groundwater were sampled at AOC 653 to investigate the presence of residual contamination from the leaking tank and other possible spills.

5.7.1 Current Use

The AOC 653 site is currently used by the United States Coast Guard, a recent federal tenant of the former naval base, for boat and trailer storage.

5.7.2 Future Use

According to the Charleston Naval Complex Redevelopment Authority, this area will likely be used for industrial purposes in the future, which is consistent with its current use.

5.7.3 ISM Status

The Navy DET has recently removed soil at the subject site. The results of the Navy DET ISM at the site will be reviewed by EnSafe and considered during the CMS process.

5.7.4 Fate and Transport Summary

The possibility of AOC 653 soil to groundwater, groundwater to surface water and soil to air cross-media transport was evaluated during the RFI. None of these contaminant transport routes was considered to be a concern for this site.

5.7.5 Human Health Risk Assessment Summary

Table 5.7.1 summarizes AOC 653 total groundwater risk and hazard and soil risk and hazard in excess of Zone H background.

Table 5.7.1
AOC 653 Site Human Health Risk and Hazard above Background[1]

		Surface Soil		Shallow GW		Deep GW	
		HI[2]	ILCR[3]	HI	ILCR	HI	ILCR
AOC 653	Res.[4]	NA	6E-7	NA	8E-4	ND	ND
	Ind.[4]	NA	2E-7	NA	2E-4	ND	ND

Notes:

1 — Maximum background risk in shallow surface soil =arsenic (4.1E-5 Res.; 5.8E-6 Ind.); beryllium (1.1E-5 Res.;1.5E-6 Ind.); BEQ (6.7E-6 Res.; 1.4E-6 Ind.).
Maximum background hazard shallow surface soil =arsenic (0.71 Res.; 0.04 Ind.); beryllium (0.004 Res.;0.0 Ind.); BEQ (0.0 Res.;0.0 Ind.).
Background risk and hazard has not been established for groundwater

2 — Cumulative hazard is presented as HI (hazard index). For sites with no inorganic COCs, hazard is generally not applicable.

3 — Cumulative risk is presented as ILCR (incremental lifetime cancer risk).

4 — Residential risk and hazard are for a child; Industrial risk and hazard are for an adult site worker.

NA — Site hazard is inapplicable to the organic COCs at this site.

ND — Not determined. Deep GW was not sampled during the RFI at this site.

Surface soil risk under both residential and industrial scenarios is below 1E-6.

The sole contributor to risk and hazard in groundwater at this site is arsenic. Arsenic was detected at concentrations exceeding its UTL or MCL in only one of two groundwater monitoring wells at the site. In addition, the groundwater from this well (NBCH653001) exceeded the arsenic MCL of 50 mg/L only once during four quarters of sampling (Table 5.7.2).

5.7.6 Ecological Risk Assessment Summary

No ecological risk is anticipated for AOC 653 due to lack of suitable habitat and ecological receptors.

Table 5.7.2
AOC 653 and Nearby Grid Wells
(mg/L arsenic)

Well	1st Qtr.	2nd Qtr.	3rd Qtr.	4th Qtr.
NBCH653001	ND	36.6	54.1	45
NBCHGRD003	ND	24.8	41	42.1
NBCHGRD006	7.1	7.3	43.1	37.4

Note:
ND = non-detect

5.7.7 Remedial Objectives

The project team has requested that AOC 653 be placed in the CMS process due to arsenic in groundwater.

5.7.8 Potential Remedial Alternatives

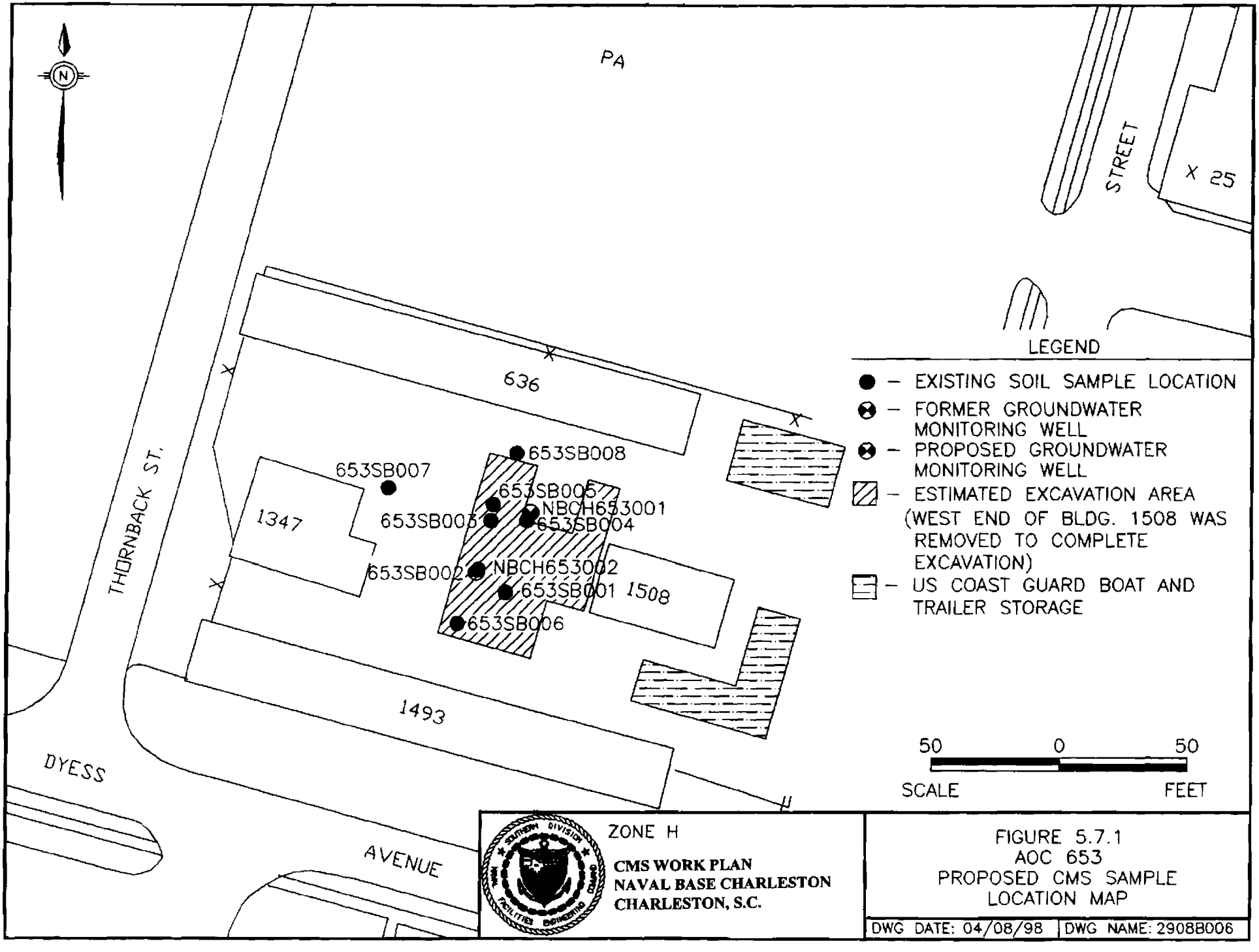
Based on the project team's concern about arsenic in groundwater, proposed remedial alternative(s) for this site include:

- Additional short-term groundwater monitoring (e.g., two more quarters) to confirm or refute the presence of arsenic and to determine if remedial action is required

5.7.9 CMS Data Needs

Based on the project team's concern about arsenic in groundwater, the following activities are proposed (Figure 5.7.1):

- Construction of a single monitoring well in the center of the site (previously constructed wells, NBCH653001 and NBCH653002 were damaged/removed during Navy DET activities)


PA
STREET
X 25
636
653SB008
653SB007
653SB005
NBCH653001
653SB003
653SB004
1347
653SB002
NBCH653002
653SB001
1508
653SB006
THORNBACK ST.
1493
DYESS
AVENUE
LEGEND
● – EXISTING SOIL SAMPLE LOCATION
– FORMER GROUNDWATER MONITORING WELL
– PROPOSED GROUNDWATER MONITORING WELL
– ESTIMATED EXCAVATION AREA (WEST END OF BLDG. 1508 WAS REMOVED TO COMPLETE EXCAVATION)
– US COAST GUARD BOAT AND TRAILER STORAGE
50 0 50
SCALE FEET
ZONE H
CMS WORK PLAN
NAVAL BASE CHARLESTON
CHARLESTON, S.C.
FIGURE 5.7.1
AOC 653
PROPOSED CMS SAMPLE LOCATION MAP
DWG DATE: 04/08/98
DWG NAME: 2908B006

- Two rounds of groundwater sampling from newly constructed well and nearby grid well pairs, NBCHGRD003/3D and NBCHGRD006/06D, for arsenic and VOCs.
- Review background and zone-wide arsenic levels for comparison

5.8 AOC 655

AOC 655, which is behind Building 656, the former Base Exchange, is the site of a fuel line rupture in 1985 that released approximately 300 gallons of No. 2 fuel oil. The fuel line, which originated from a 5,800-gallon UST, supplied fuel to a boiler in Building 656. A large portion of the site is covered with asphalt or concrete. However, a small area between Building 656 and the UST is covered with grass and gravel.

It is important to note that AOC 655 was included in the RFI at the request of the USEPA and SCDHEC. This AOC is not considered a hazardous material or waste treatment, storage, or disposal area. Virgin petroleum products are not classified as hazardous material or waste; they are typically regulated as a petroleum or special material/waste. Therefore, soil and groundwater were sampled at AOC 655 during the RFI to assess the presence or absence of residual contamination resulting from the previous oil spill and other possible releases that may have occurred nearby.

5.8.1 Current Use

The AOC 655 site is not currently used by either federal or nonfederal tenants, nor is the former Base Exchange presently in use.

5.8.2 Future Use

According to the Charleston Naval Complex Redevelopment Authority, this area will likely be used for industrial purposes in the future.

5.8.3 ISM Status

The Navy DET has recently removed a UST and associated soil at the subject site. The results of the Navy DET ISM at the site will be reviewed by EnSafe and considered during the CMS process.

5.8.4 Fate and Transport Summary

The possibility of AOC 655 soil to groundwater, groundwater to surface water, and soil to air cross-media transport was evaluated during the RFI. None of these contaminant transport routes was considered a concern for this site.

5.8.5 Human Health Risk Assessment Summary

Table 5.8.1 summarizes AOC 655 total groundwater risk and hazard and soil risk and hazard in excess of Zone H background.

Table 5.8.1
AOC 655
Site Human Health Risk and Hazard above Background[1]

		Surface Soil		Shallow GW		Deep GW	
		HI[2]	ILCR[3]	HI	ILCR	HI	ILCR
AOC 655	Res.[4]	NA	1.3E-6	6	1E-4	ND	ND
	Ind.[4]	NA	3.7E-7	1	4E-5	ND	ND

Notes:

1 — Maximum background risk in shallow surface soil =arsenic (4.1E-5 Res.; 5.8E-6 Ind.); beryllium (1.1E-5 Res.;1.5E-6 Ind.); BEQ (6.7E-6 Res.; 1.4E-6 Ind.).
Maximum background hazard shallow surface soil =arsenic (0.71 Res.; 0.04 Ind.); beryllium (0.004 Res.;0.0 Ind.); BEQ (0.0 Res.;0.0 Ind.).
Background risk and hazard has not been established for groundwater

2 — Cumulative hazard is presented as HI (hazard index). For sites with no inorganic COCs, hazard is generally not applicable.

3 — Cumulative risk is presented as ILCR (incremental lifetime cancer risk).

4 — Residential risk and hazard are for a child; Industrial risk and hazard are for an adult site worker.

NA — Site hazard is inapplicable to the organic COCs at this site.

ND — Not determined. Deep GW was not sampled during the RFI at this site.

Surface soil risk above background is near the lower threshold risk of 1E-6 under the residential scenario and is below the threshold under the industrial scenario. The Navy DET has also excavated and removed some soil near sample point 655-SB-001, which was one of the three highest point-risk locations.

The primary contributor to risk in groundwater at this site is arsenic. However, arsenic exceeded the UTL in only one of three groundwater monitoring wells (NBCH655003), and did not exceed the arsenic MCL of 50 mg/L through four quarters.

Table 5.8.2
AOC 655
(mg/L arsenic)

Well	1st Qtr.	2nd Qtr.	3rd Qtr.	4th Qtr.
NBCH655003	42.3	27.9	41.3	32.8

Note:
ND = non-detect

5.8.6 Ecological Risk Assessment Summary

No ecological risk is anticipated for AOC 655 due to lack of suitable habitat and ecological receptors.

5.8.7 Remedial Objectives

The project team has requested that AOC 655 be placed in the CMS process due to arsenic in groundwater.

5.8.8 Potential Remedial Alternatives

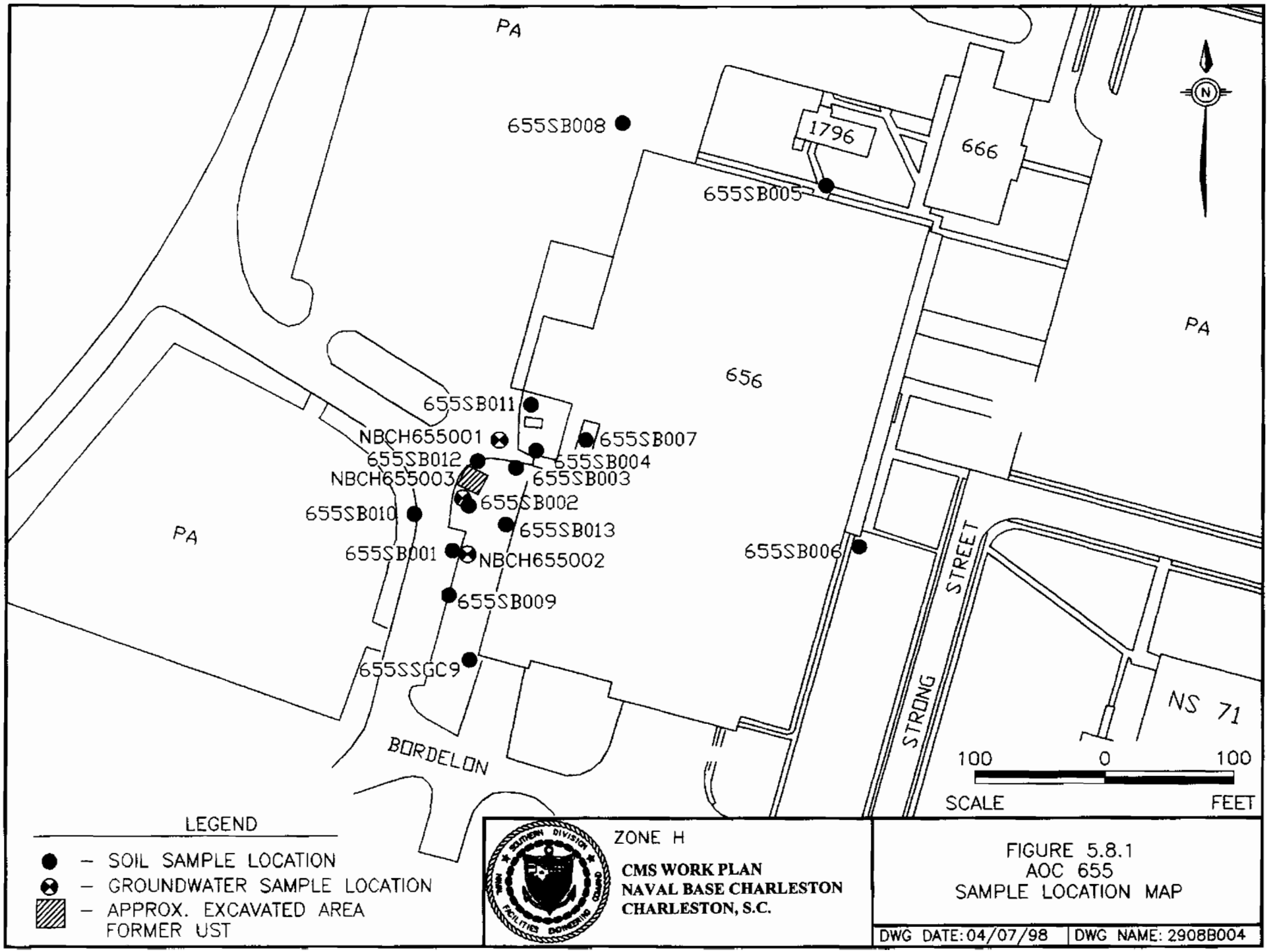
Based on the project team's concern about groundwater, proposed remedial alternative(s) for this site include:

- Additional short-term groundwater monitoring (e.g., two more quarters) of wells NBCH-655-001, -002, and - 003 to confirm or refute the presence of arsenic and to determine if remedial action is required.

5.8.9 CMS Data Needs

Based on the project team's concern about groundwater, the following activities are proposed Figure 5.8.1):

- Two additional rounds of groundwater sampling with analysis of groundwater for arsenic and a background and zone-wide comparative analysis of arsenic levels


PA
655SB008
1796
666
655SB005
656
655SB011
NBCH655001
655SB007
655SB012
655SB004
NBCH655003
655SB003
655SB002
655SB010
655SB013
655SB001
NBCH655002
655SB009
655SSGC9
655SB006
PA
PA
STRONG STREET
NS 71
BORDELON
100 0 100
SCALE FEET
LEGEND
– SOIL SAMPLE LOCATION
– GROUNDWATER SAMPLE LOCATION
– APPROX. EXCAVATED AREA FORMER UST
ZONE H
CMS WORK PLAN
NAVAL BASE CHARLESTON
CHARLESTON, S.C.
FIGURE 5.8.1
AOC 655
SAMPLE LOCATION MAP
DWG DATE: 04/07/98
DWG NAME: 2908B004

5.9 AOC 656

AOC 656 is the site of a 1974 oil release between Buildings NS71 and AST 602. The release resulted from a ruptured underground line connecting the 8,000-gallon AST to a boiler in Building NS71. Of the 285 gallons released during the incident, 275 gallons are reported to have been recovered.

AOC 656 was included in the RFI at the request of the USEPA and SCDHEC. It is not considered a hazardous material or waste treatment, storage, or disposal area. Virgin petroleum products are not classified as hazardous material or waste; they are typically regulated as a petroleum or special material/waste. Therefore, the soil and groundwater were sampled to determine if residual contamination remained from the previous release and other possible releases at the site.

5.9.1 Current Use

The AOC 656 site is not currently used by either federal or nonfederal tenants. The AST remains at the site and the area between it and Building NS71 is presently grassed.

5.9.2 Future Use

According to the Charleston Naval Complex Redevelopment Authority, this area will likely be used for industrial purposes in the future.

5.9.3 ISM Status

No ISM have been completed by the Navy DET at AOC 656.

5.9.4 Fate and Transport Summary

The possibility of AOC 656 soil to groundwater, groundwater to surface water and soil to air cross-media transport was evaluated during the RFI. None of these contaminant transport routes was considered to be a site concern.

5.9.5 Human Health Risk Assessment Summary

Table 5.9.1 summarizes AOC 656 total groundwater risk and hazard and soil risk and hazard in excess of Zone H background.

Table 5.9.1
AOC 656
Site Human Health Risk and Hazard above Background[1]

		Surface Soil		Shallow GW		Deep GW	
		HI[2]	ILCR[3]	HI	ILCR	HI	ILCR
AOC 656	Res.[4]	NA	<bkgd.	0.01	8E-6	ND	ND
	Ind.[4]	NA	<bkgd.	0.08	2E-6	ND	ND

Notes:

1 — Maximum background risk in shallow surface soil =arsenic (4.1E-5 Res.; 5.8E-6 Ind.); beryllium (1.1E-5 Res.;1.5E-6 Ind.); BEQ (6.7E-6 Res.; 1.4E-6 Ind.).
Maximum background hazard shallow surface soil =arsenic (0.71 Res.; 0.04 Ind.); beryllium (0.004 Res.;0.0 Ind.); BEQ (0.0 Res.;0.0 Ind.).
Background risk and hazard has not been established for groundwater

2 — Cumulative hazard is presented as HI (hazard index). For sites with no inorganic COCs, hazard is generally not applicable.

3 — Cumulative risk is presented as ILCR (incremental lifetime cancer risk).

4 — Residential risk and hazard are for a child; Industrial risk and hazard are for an adult site worker.

NA — Site hazard is inapplicable to the organic COCs at this site.

ND — Not determined. Deep GW was not sampled during the RFI at this site.

Site risk was below background for surface soils, and 2,3,7,8-TCDD Eq. was the sole risk driver for groundwater. However, it was detected exclusively in NBCH656001, in only the first of four quarters, and at a concentration below its MCL (3E-8 mg/L).

5.9.6 Ecological Risk Assessment Summary

No ecological risk is anticipated for AOC 656 due to lack of suitable habitat and ecological receptors.

5.9.7 Remedial Objectives

The project team has requested that AOC 656 be placed in the CMS process due to potential groundwater concerns.

5.9.8 Potential Remedial Alternatives

Based on the project team's concern about groundwater, proposed remedial alternative(s) for this site include:

- Additional short-term groundwater monitoring (e.g., two more quarters) to confirm or refute the presence of 2,3,7,8-TCDD equivalents and to determine if remedial action is required

5.9.9 CMS Data Needs

Based on the project team's concern about groundwater, the following activities are proposed:

- Two more additional rounds of groundwater sampling with analysis for VOCs and 2,3,7,8-TCDD equivalents and a background and zone-wide comparative analysis of results

5.10 AOC 666

AOC 666, an approximately 10-foot by 30-foot area, is a former underground storage tank (UST), which supplied fuel oil to the adjacent heating plant (Building NS44) when the base was in operation. The UST's exact capacity is unknown but is assumed to have been between 5,000 and 10,000 gallons. Before the site was constructed in 1958, the surrounding area was an airstrip.

AOC 666 was included in the RFI at the request of the USEPA and SCDHEC. It is not considered a hazardous material or waste treatment, storage, or disposal area. Virgin petroleum products are not classified as hazardous material or waste; they are typically regulated as a petroleum or special material/waste. Therefore, the soil and groundwater were sampled to determine if contamination resulted from fuel oil storage and dispensing from the UST or other releases at the site.

5.10.1 Current Use

The AOC 666 site is not currently used by either federal or nonfederal tenants though the adjacent Building NS44 appears to be used for industrial purposes (e.g., former boiler room). The area between NS44 and Osprey Street makes up the bulk of AOC 666. This area is presently grassed.

5.10.2 Future Use

According to the Charleston Naval Complex Redevelopment Authority, the area surrounding AOC 666 will likely be used for future government training which may require personnel barracks, administrative-type buildings, classrooms for adults, dining halls, etc. However, the relatively small AOC 666 area will likely remain grassed and undeveloped.

5.10.3 ISM Status

The Navy DET has recently removed the fuel oil UST from the subject site. The excavation was backfilled with the soil removed from it and other soil obtained from offsite. More than 90% of the RFI sampling points were located in surface soil that has since been excavated and dumped

back into the former tank pit. The results of the Navy DET ISM at the site will be reviewed by EnSafe and considered during the CMS process.

5.10.4 Fate and Transport Summary

The possibility of AOC 666 soil to groundwater, groundwater to surface water, and soil to air cross-media transport was evaluated during the RFI. None of these contaminant transport routes was considered a site concern.

5.10.5 Human Health Risk Assessment Summary

Table 5.10.1
AOC 666
Site Human Health Risk and Hazard above Background[1]

		Surface Soil		Shallow GW		Deep GW	
		HI[2]	ILCR[3]	HI	ILCR	HI	ILCR
AOC 666	Res.[4]	NA	8.5E-5	0.0007	8E-6	ND	ND
	Ind.[4]	NA	1.5E-5	0.0002	2E-6	ND	ND

Notes:

1 – Maximum background risk in shallow surface soil =arsenic (4.1E-5 Res.; 5.8E-6 Ind.); beryllium (1.1E-5 Res.;1.5E-6 Ind.); BEQ (6.7E-6 Res.; 1.4E-6 Ind.).
Maximum background hazard shallow surface soil =arsenic (0.71 Res.; 0.04 Ind.); beryllium (0.004 Res.;0.0 Ind.); BEQ (0.0 Res.;0.0 Ind.).
Background risk and hazard has not been established for groundwater

2 – Cumulative hazard is presented as HI (hazard index). For sites with no inorganic COCs, hazard is generally not applicable.

3 – Cumulative risk is presented as ILCR (incremental lifetime cancer risk).

4 – Residential risk and hazard are for a child; Industrial risk and hazard are for an adult site worker.

NA – Site hazard is inapplicable to the organic COCs at this site.

ND – Not determined. Deep GW was not sampled during the RFI at this site.

AOC 666 Surface Soil Risk and Hazard: The primary contributors to surface soil risk above background at this site were BEQs (4.6E-5 Res; 9.4E-6 Ind), arsenic (3.9E-5 Res; 5.5 E-6 Ind), BEQs, and aroclor-1260. However, BEQs were driven by a non-detect sample point where ½

the sample quantification limit was used as a default value in risk calculations. If BEQs from this point are removed, site risk drops to 5.5E-5 Residential and 8.9E-6 Industrial.

Arsenic was driven by concentrations in sample point 666-SB-004. This point and all others may have been excavated during the ISM UST and placed back in the pit following completion of the tank removal. If this point were removed, site risk from surface soil drops to 1.8E-5 Residential and 3.6E-6 Industrial. The distribution of BEQs and arsenic are shown on Figures 5.10.1 and 5.10.2.

5.10.6 Ecological Risk Assessment Summary

No ecological risk is anticipated for AOC 666 due to lack of suitable habitat and ecological receptors.

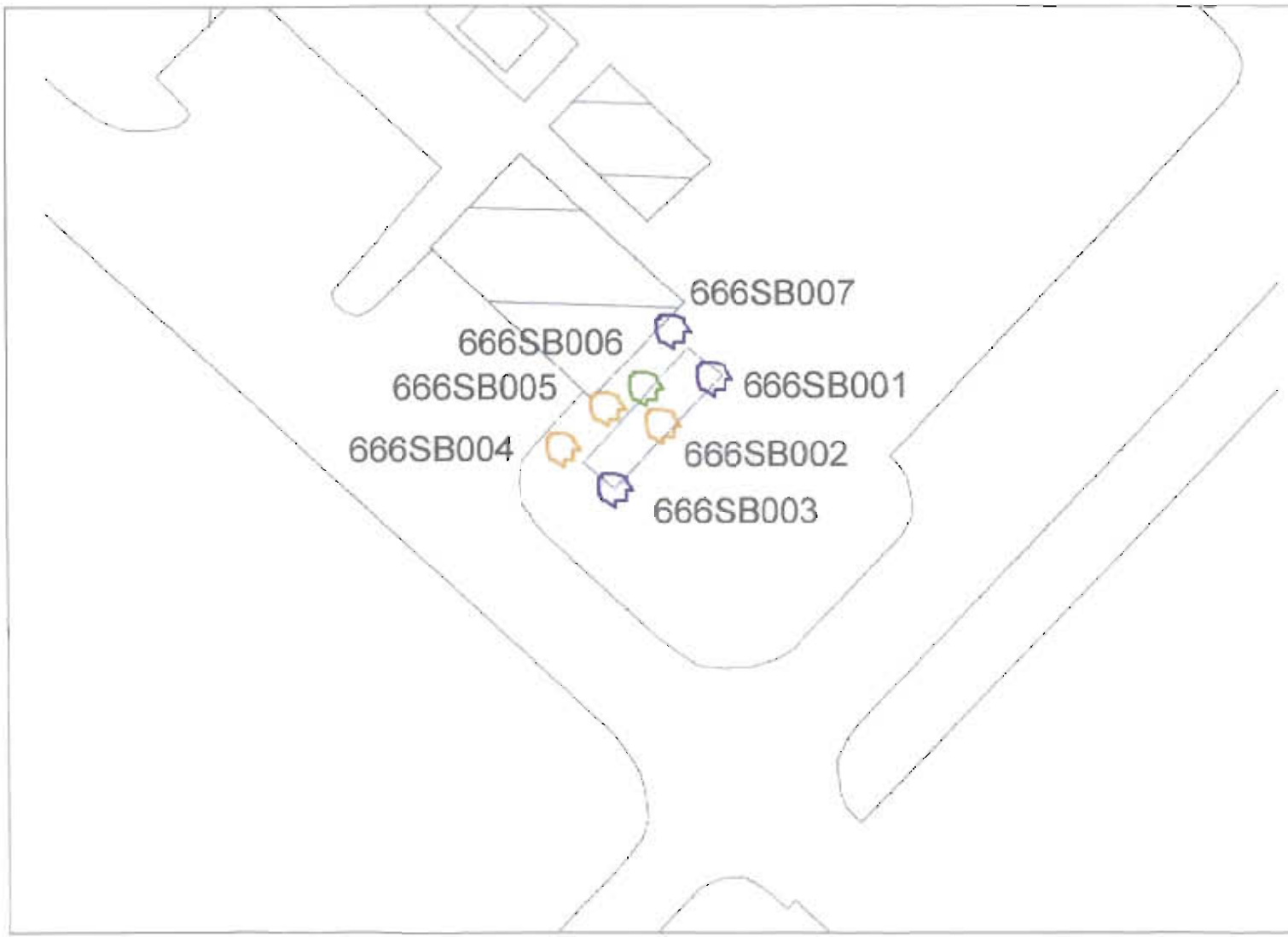
5.10.7 Remedial Objectives

The project team has requested that AOC 666 be placed in the CMS process due to arsenic in surface soil. However, soil sample locations have been disturbed due to UST removal activities. Therefore, additional sampling is needed to assess whether arsenic in surface soil remains a concern at this site.

5.10.8 Potential Remedial Alternatives

Based on the project team's concern about surface soil arsenic, proposed remedial alternative(s) for this site include:

- Transfer of site to UST program
- Excavation with offsite disposal



CMS WORK PLAN

Charleston Naval Base
Zone H
CHARLESTON, S.C.

Figure 5.10.1
Surface Soil Risk Above Background
Residential
AOC 666

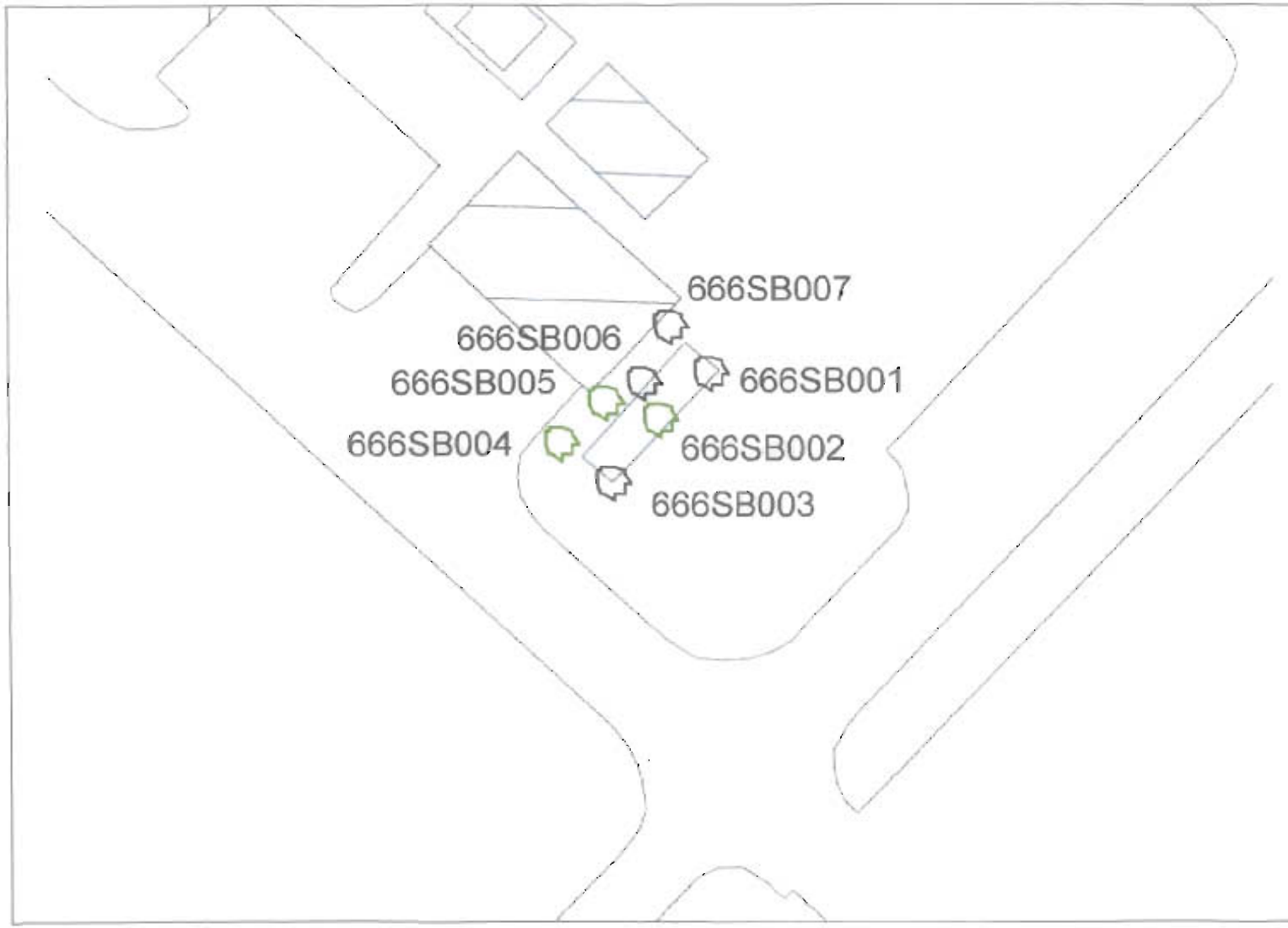
Legend
- Residential Risk > 1E-4
- Residential Risk between 1E-5 and 1E-6
- Residential Risk between 1E-6 and 1E-7
- Residential Risk below background level**
- Residential Risk between 1E-4 and 1E-5
- Residential Risk < 1E-7

**or sample was non-detect for risk drivers

- Water
- Pier
- Road
- Bldg
- Fence

N
W
E
S

1:35



CMS WORK PLAN
Charleston Naval Base
Zone H
CHARLESTON, S.C.

Figure 5.10.2
Surface Soil Risk Above Background
Industrial
AOC 666

Legend
Industrial Risk > 1E-4
Industrial Risk between 1E-5 and 1E-6
Industrial Risk between 1E-6 and 1E-7
Industrial Risk below background**
Industrial Risk between 1E-4 and 1E-5
Industrial Risk < 1E-7
** or sample was non-detect for risk drivers
Water
Pier
Road
Bldg
Fence

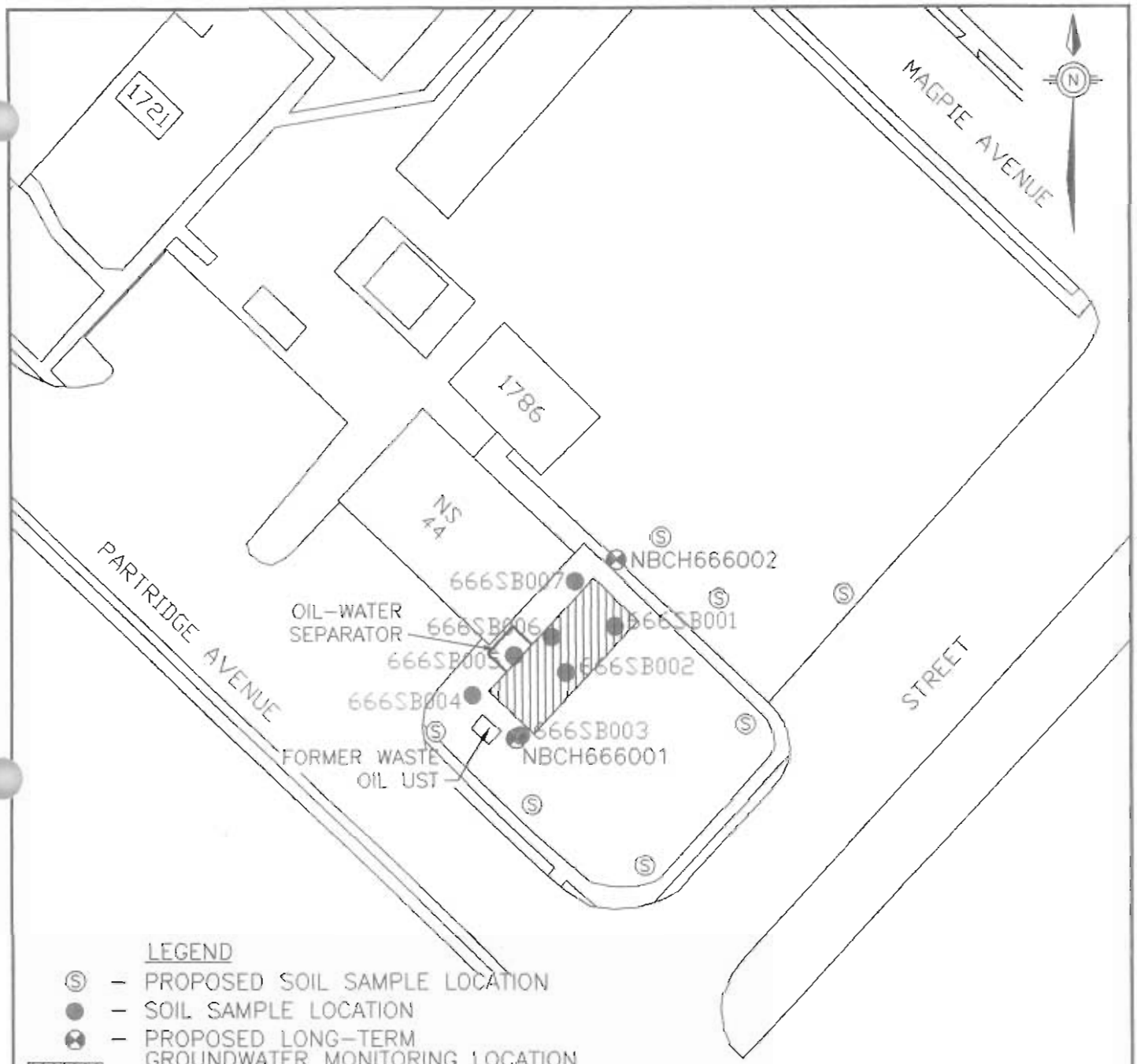
N
W
E
S

1:35

5.10.9 CMS Data Needs

Based on the project team's concern about surface soil arsenic, the following activities are proposed (Figure 5.10.3):

- Complete additional borings at the site to assess whether surface soil significantly exceeds background risk and hazard



LEGEND

Ⓢ – PROPOSED SOIL SAMPLE LOCATION

● – SOIL SAMPLE LOCATION

⊗ – PROPOSED LONG-TERM GROUNDWATER MONITORING LOCATION

▨ – APPROXIMATE EXCAVATION AREA 50'X20'

NOTES:

- OIL-WATER SEPARATOR ON SITE (BETWEEN NS 44 BLDG AND EXCAVATION PIT)
- FILLED AND GRADED AS OF MARCH 1998 (IE, EXCAVATION AREA)
- BACKFILLED WITH EXISTING EXCAVATION SOIL
- DET UST CLOSURE REPORT AVAIL. 16 OCT. 96 CLOSURE DATE

50 0 50

SCALE FEET

ZONE H
CMS WORK PLAN
NAVAL BASE CHARLESTON
CHARLESTON, S.C.

FIGURE 5.10.3
AOC 666
PROPOSED CMS SAMPLE LOCATION MAP

DWG DATE: 04/08/98 | DWG NAME: 2908B016

6.0 CMS SCHEDULE AND REPORT OUTLINE

CMS Schedule

Figure 6.1 outlines the anticipated schedule for the CMS process for Zone H. The total time to complete the entire Zone H CMS is strictly site-specific. The forecasted completion time could be increased or decreased if site conditions or cleanup goals change during the CMS process.

Innovative technologies typically require more preparation and evaluation time (e.g., treatability studies) than demonstrated technologies. However, the possible benefit, such as reduced costs, more effective remediation, less site disruption, and public acceptance/perception obtained from implementing an innovative technology can far outweigh any possible increases in project completion time. Moreover, not all innovative technologies adversely impact the project time line.

CMS Report

The CMS report will present the objectives and goals of the study, site conditions applicable to the CMS, the results of any additional field activities, and a matrix that shows how the remedial alternatives rank compared to the five balancing criteria previously described.

The CMS report will include:

Section 1	Introduction
Section 2	Purpose of the CMS
Section 3	Proposed Cleanup Objectives
Section 4	Site Descriptions
Section 5	Results of Additional Studies (CMS sampling, treatability/pilot studies, aquifer testing, groundwater modeling, etc.)
Section 6	Identification, Screening, Evaluation and Ranking of Remedial Alternative(s)
Section 7	Community Relations Plan
Section 8	Signatory Requirement
Appendix	If needed

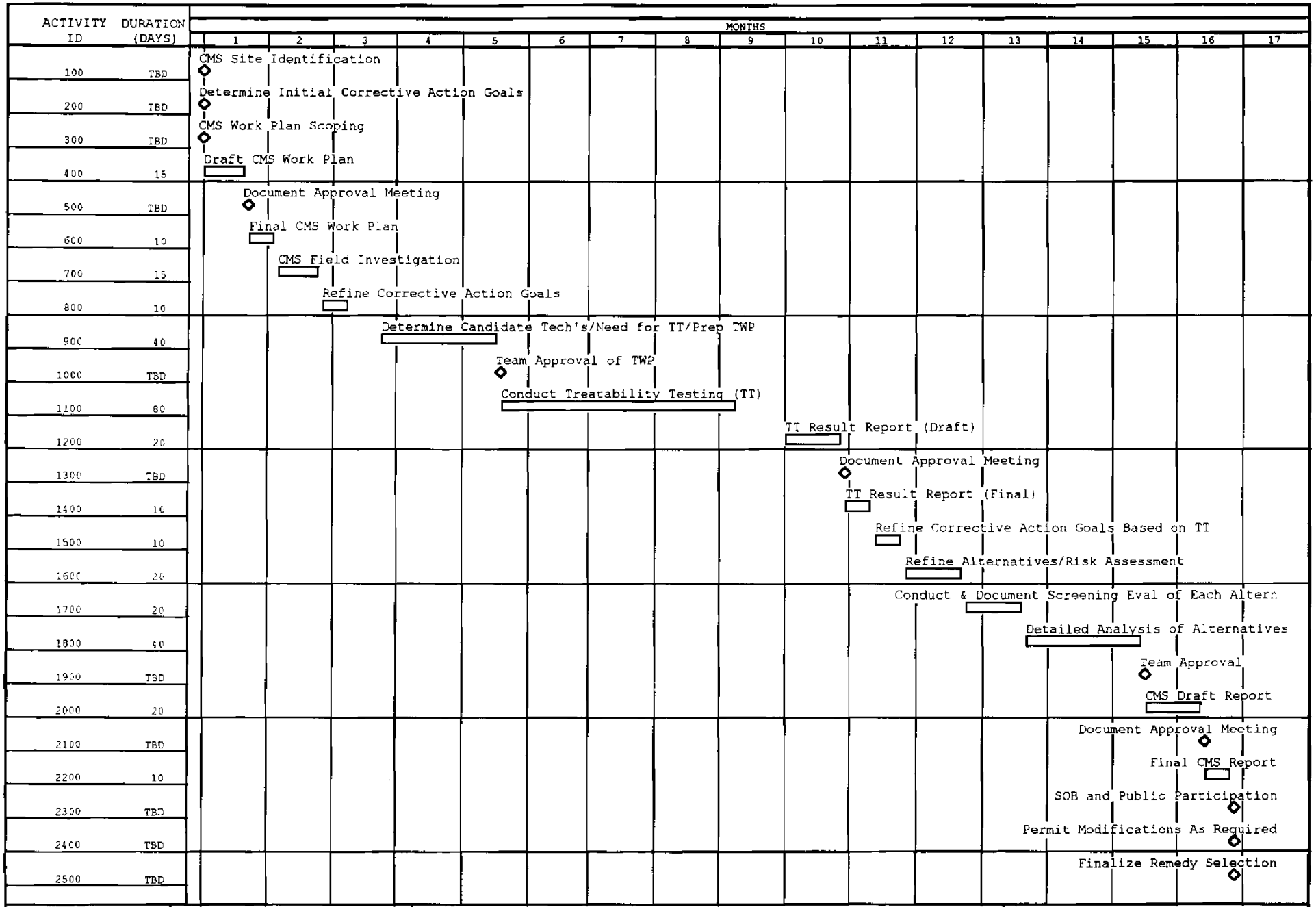


Figure 6.1
Naval Base Charleston, Zone H
CMS Project Schedule

7.0 REFERENCES

AFCEE, *Technical Protocol for Implementing Intrinsic Remediation with Long-Term Monitoring for Natural Attenuation of Fuel Contamination Dissolved in Groundwater*, Air Force Center for Environmental Excellence, San Antonio, Texas.

American Public Health Association. (1992). *Standard Methods for the Examination of Water and Wastewater*, 18th ed. Washington, D.C.

American Society for Testing and Materials. (1980). *Standard Practice for Conducting Basic Acute Toxicity Tests with Fish, Macroinvertebrates, and Amphibians*. May 1980, ASTM Committee E-35.23.

American Society for Testing and Materials. (1990). *Description and Identification of Soils (Visual-Manual Procedure)*. ASTM D2488-90.

American Society for Testing and Materials. (1990). *Standard Guide for Conducting Toxicity Tests with Freshwater Invertebrates*. Document #1 E 1383. ASTM Subcommittee E-47.03. November 1990.

American Society for Testing and Materials. (1990). *Standard Guide for Collection, Storage, Characterization and Manipulation of Sediments for Toxicology Testing*. Document #1 E-1391. ASTM Subcommittee E-47.03. November 1990.

Clesceri, Lenore S. Greenburg, Arnold E. Trussell, R. Rhodes (Eds.). (1989). *Standard Methods for the Examination of Water and Wastewater*, 17th ed. American Public Health Association, (Part 8).

Corbitt, Robert A. (1990). *Standard Handbook of Environmental Engineering*, McGraw-Hill, Inc.

EnSafe/Allen & Hoshall, Inc. (1994). *Final Comprehensive Project Management Plan RCRA Facility Investigation,* Memphis, Tennessee, August 30, 1994.

EnSafe/Allen & Hoshall, Inc. (1994). *Final Comprehensive Sampling and Analysis Plan (CSAP) RCRA Facility Investigation,* Memphis, Tennessee, August 30, 1994.

EnSafe/Allen & Hoshall, Inc. (1997). *Final Comprehensive Corrective Measures Study Project Management Plan and Work Plan,* Volumes I and II, Memphis, Tennessee, June 25, 1997.

Industrial Economics, Inc. (1992). *Superfund Cashout User's Manual*, PB94-141678, Department of Commerce National Technical Information Service, September1992.

Lohman, S.W. (1972). *Groundwater Hydraulics*: U.S. Geological Survey Professional Paper 708. Washington, D.C.

Metcalf & Eddy, Inc. (1991). *Wastewater Engineering Treatment, Disposal, and Reuse*, 3rd ed. McGraw-Hill, Inc.

Naval Energy and Environmental Support Activity. (June 1988). NEESA 20.2-047B. *Sampling and Chemical Analysis Quality Assurance Requirements for the Navy Installation Restoration Program.* Port Hueneme, California.

Naval Energy and Environmental Support Activity. (February 1985). NEESA 20.2-031.A. *Groundwater Monitoring Guide.* Port Hueneme, California.

Nyer, E.K., et al., *In-Situ Treatment Technology,* Geraghty and Miller Environmental Science and Engineering Services; Lewis Publishers, Boca Raton, 1996.

Reed, P.B., Jr. (1988). *National List of Plant Species that Occur in Wetlands: National Summary*. U.S. Department of the Interior, Washington, D.C. Biological Report 88(24).

South Carolina Department of Health and Environmental Control. (1985). *South Carolina Well Standards and Regulations.*

South Carolina Department of Health and Environmental Control. (1992). *Water Classifications and Standards.*

Southern Division Engineering Command, Revision 4. (March 1989). *Guidelines for Groundwater Monitoring Well Installation.*

State of South Carolina Water Resources Commission Report, Number 139, A. Drennan Park. (1985). *The Groundwater Resources of Charleston, Berkeley, and Dorchester Counties, South Carolina.*

U.S. Environmental Protection Agency (USEPA). (1996). *Environmental Compliance Branch Standard Operating Procedures and Quality Assurance Manual.* U.S. Environmental Protection Agency, Region IV, Environmental Services Division. May 1996.

USEPA. (1995). *Guide to Documenting Cost and Performance for Remediation Projects*, Member Agencies of the Federal Remediation Technologies Roundtable, March 1995.

USEPA. (1995). *Application of the CERCLA Municipal Landfill Presumptive Remedy to Military Landfills*, Quick Reference Fact Sheet, EPA, June 1995.

USEPA. (1994). *Remediation Technologies Screening Matrix and Reference Guide*, EPA/542/B-94/013, October 1994.

USEPA. (1993). *Presumptive Remedies: Site Characterization and Technology Selection for CERCLA Sites with Volatile Organic Compounds in Soils*, Quick Reference Fact Sheet, EPA/540/F-93/048, September 1993.

USEPA. (1993). *Presumptive Remedies: Policy and Procedures*, Quick Reference Fact Sheet, EPA/540/F-93/047, September 1993.

USEPA. (1993). *Presumptive Remedy for CERCLA Municipal Landfill Sites*, Quick Reference Fact Sheet, EPA/540/F-93/035, September 1993.

USEPA. (1991). *Management of Investigation-Derived Wastes During Site Inspections*. Office of Emergency and Remedial Response, Publication 7345.3-02FS. May 1991.

USEPA. (1991). *Statement of Work (SOW) for Organic Analysis*, OLM01.8. August 1991.

USEPA. (1991). *Statement of Work (SOW) for Inorganic Analysis*, ILM02.1. September 1991.

USEPA. (1991). *National Functional Guidelines for Organic Data Review.*

USEPA. (1991). *Survey of Materials-Handling Technologies Used at Hazardous Waste Sites*, EPA/540/2-91/010, June 1991.

USEPA. (1990). *Analytical Support Branch Laboratory Operations and Quality Control Manual*. U.S. Environmental Protection Agency, Region IV, Environmental Services Division. September 1990.

USEPA. (1990). *Ecological Indicators*. Atmospheric Research and Exposure Assessment Laboratory. Office of Research and Development. Research Triangle Park, N.C.

USEPA. (1989). *Ecological Assessment of Hazardous Waste Sites: A Field and Laboratory Reference*. Environmental Research Laboratory. Corvallis, Oregon. USEPA/600/3-89/013).

USEPA. (1989). *Risk Assessment Guidance for Superfund: Volume 1 – Human Health Evaluation Manual*, December 1989 (Interim Final), and *Volume 2 – Environmental Evaluation Manual*, March 1989 (Interim Final), Office of Emergency and Remedial Response.

USEPA. (1989). *Seminar Publication, Corrective Action: Technologies and Applications*, EPA/625/4-89/020, September 1989.

USEPA. (1988). *National Functional Guidelines for Inorganic Data Review.*

USEPA, (1988a). *Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA, Interim Final.* Office of Emergency and Remedial Response. October 1988.

USEPA, (1988b). *CERCLA Compliance with Other Laws Manual, Draft Guidance*. Office of Emergency and Remedial Response. August 1988.

USEPA, (1988c). *National Oil and Hazardous Substances Pollution Contingency Plan: Proposed Rule. 53 FR 51444.* Office of Emergency and Remedial Response. December 1988.

USEPA. (1988). *Technology Screening Guide for Treatment of CERCLA Soils and Sludges*, EPA/540/2-88/004, September 1988.

USEPA. (1987). *Methods for Organic Chemical Analysis of Municipal and Industrial Wastewater.* 40 CFR Appendix A to Part 136. (July 1987).

USEPA. (1987). *Data Quality Objectives for Remedial Response Activities Development Process.* Office of Solid Waste and Emergency Response, Directive 9355.0-7B.

USEPA. (1986). *Test Methods for the Evaluation of Solid Wastes, SW-846,* Third Edition. (September 1986). Office of Solid Waste and Emergency Response.

USEPA. (1984). *Review of In-Place Treatment Techniques for Contaminated Surface Soils*, Volume 1, EPA/540/2-84/003a, September 1984.

USEPA. (1984). *Review of In-Place Treatment Techniques for Contaminated Surface Soils*, Volume 2, EPA/540/2-84/003b, November 1984.

USEPA. (1983). *Methods for Chemical Analysis of Water and Wastes*, EPA-600/4/79-020, Revised March 1983.

USEPA. (1982). *Handbook for Remedial Action at Waste Disposal Sites*, EPA-625/6-82-006, March 1982.

U.S. Environmental Protection Agency, *Use of Monitored Natural Attenuation at Superfund, RCRA Corrective Action, and Underground Storage Tank Sites,* U.S. Environmental Protection Agency Technical Memorandum, T. Fields, Acting Assistant Administrator, 9 June 1997.

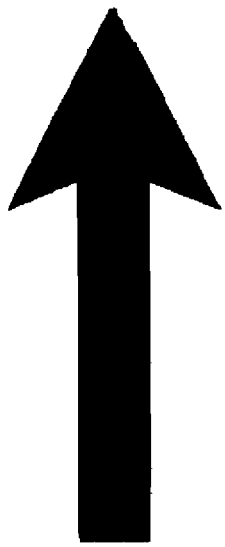
8.0 SIGNATORY REQUIREMENT

Condition I.E. of the Hazardous and Solid Waste Amendments (HSWA) portion of the RCRA Part B Permit (EPA SCO 170 022 560) states: All applications, reports, or information submitted to the Regional Administrator shall be signed and certified in accordance with Section 40 CFR 270.11. The certification reads as follows:

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

_____ Date _____

P.M. Rose
Officer In Charge
Caretaker Site Office, Charleston



SECTION A

APPENDIX A

RISK REDUCTION CALCULATION TABLES

RISK REDUCTION CALCULATION TABLES

INTRODUCTION

This appendix contains the data sets and results for the residential and industrial risk and hazard calculations for each Zone H SWMU and AOC where further corrective measures may be necessary to address surface soil contamination. The appendix is organized by site into separate sections, with each section containing a data summary, a total site risk and hazard summary, a point risk and hazard summary reflecting both total and above-background results, and a point risk reduction summary.

Surface Soil Concentration Summaries

These tables (Surface Soil Concentration Summary) present the COCs and their respective sample concentrations used in calculating point and site risk and hazard. The upper portion of these tables is raw data collected during the RFI. Shaded values represent samples which were not detected. Default concentrations of ½ the sample quantification limit (SQL) were used for non-detections.

The lower portion of the tables shows statistical results including:

- The number of samples (n) in the data set.
- The standard deviation of the natural log-transformed data set.
- The sample mean of the natural log-transformed data set.
- The H-value used in calculating the 95% UCL of the natural log-transformed data set.
- The 95% UCL converted to standard, non-transformed units.
- The maximum observed concentration in the data set.
- The Exposure Point Concentration (EPC) used to calculate risk and hazard. The EPC is taken as the lesser of either the 95% UCL or the maximum observed concentration.

Hazard Quotients and Incremental Lifetime Cancer Risk Summaries

This table shows the total site risk and hazard presented by each surface soil COC based on data presented in the Surface Soil Concentration Summary table. Note that this table presents *total* site risk and *not site risk and hazard above background*.

The results presented in this table will vary from those in the RFI due to the use of recently updated values for Aroclor slope factors and use of ½ the Sample Quantification Limit (SQL) for non-detects, which were set equal to zero for point risk calculations in the RFI.

Point Risk and Hazard Summaries (1E-06)

For both residential and industrial scenarios, the Point Risk and Hazard Summary Tables present site and point results for each sample point based on COC data presented in the Surface Soil Concentration Summary Tables. Both *total risk* and *risk above background* are presented in unitless, 1E-06 terms. Where total site hazard is near or below the threshold value of 1.0, no point hazard or hazard reduction summaries are included.

Risk above background is calculated by subtracting the COC-specific background risk from the total calculated risk associated with that COC. Background risk applied only to Arsenic, Beryllium, and B(a)P Equivalents (BEQ). Background risk for each is summarized below.

	Residential	**Industrial**
Arsenic	4.1E-05	5.8E-06
Beryllium	1.1E-05	1.5E-06
BEQ	6.7E-06	1.4E-06

Point Risk and Hazard Reduction Tables and Curves

These tables summarize each sample point's contribution to site risk and hazard by combining an area-weighted approach with the EPC method approved in the RFI. First, each point's contribution to site risk is weighted using the area-weighted shown below.

$$Point\ Risk_{(area\text{-}weighted)} = Individual\ Point\ Risk \times \frac{Estimated\ Area\ Representative\ of\ Sample\ Point}{Estimated\ Total\ Site\ Area}$$

(Eq.1)

Area-weighted point risks are then sorted in decreasing order of magnitude per area. Each point is then removed in order and line at a time. Simultaneously and using the method approved in the RFI, EPCs and their corresponding site risks and hazards are recalculated as each sample point is removed.

The Risk Reduction Curves show the results of both the Area-weighted and EPC methods. However, for purposes of the CMS, only the RFI approved EPC method will be used when evaluating applicable site risk.

The columns on the Point Risk Reduction Summary tables represent:

- **Estimated Area** - the estimated area represented by each sample point. Interior sample point areas were estimated using polygons derived using a GIS-based Theissen statistical model. Exterior sample point areas were estimated visually. Figures showing areas associated with each sample point are provided with each set of tables.
- **Cumulative Area** - this column gives a running total of estimated sample point areas. The final entry in this column is equal to the total estimated site area.
- **Individual Point Risks** - Total Risk and Risk Above Background values are taken directly from the Point Risk Summary Tables.
- **Area Weighted Point Risks** - the derivation of these values is described above (Eq.1).
- **Site Risk Remaining After Point Removal** - this gives a running tally of site risk remaining after each point is hypothetically removed from consideration (excavated). The AW Method Bkgd. column gives the risk reduction in terms of area-weighted results. The UCL Method Bkgd. column gives results calculated using the EPC method approved in the RFI.

Risk Reduction and CMS Clean-up Objectives

While RFI site risk numbers give an indication of overall site risk, this appendix can be used to assess how risk is distributed over the site and where this risk is concentrated. In turn, this assessment can aide in selecting effective and protective risk-based clean-up goals (Target Risk). Once selected, site risk goals can be translated into an initial Remedial Goal Option (RGO) Concentrations for surface soil using the following formula:

$$RGO = \frac{(EPC) \times (Target\ Risk)}{(Current\ Site\ Risk)} \qquad \textbf{(Eq. 2)}$$

Site risk would then be recalculated by hypothetically removing all soil areas above this RGO from the data set. This recalculation would yield the theoretical site risk remaining if this RGO were actually used. Because 95% UCLs are often selected as the EPC, this recalculation typically yields a very conservative site risk.

Using SWMU 121 as an example, if 1E-05 residential risk above background was selected as an acceptable level of risk, and the current contribution of Beryllium to total site risk was 5.4E-05 based on a current EPC of 7.22 mg/kg, then the RGO for beryllium would be calculated as follows:

Target Risk = 1E-05 + Beryllium Background Risk
= 1E-05 + 1.1E-05
= 2.1E-05

Current Site Risk = Total Beryllium Site Risk
= 5.4E-05

RGO = [7.22 x 2.1E-05] ÷ [5.4E-05]
= 2.8 mg/kg

Applying this RGO to the original data set, site risk recalculations yield a residual site risk of 1.1E-06 above background. As previously stated, this conservative result is typical when using the recalculated 95% UCL as the EPC.

An alternate RGO could be produced through trial-and-error removal of point concentrations to see what concentration cut-off would produce an EPC equal to the initial RGO. For beryllium at SWMU 121, the alternate RGO would be 4.1 mg/kg. If all points which contained an excess of 4.1 mg/kg of beryllium were removed, the EPC would fall to 2.2 mg/kg and yield a risk above background of 5.9E-06.

Likewise, other RGOs for 1E-05 residential risk above background for other COCs at SWMU 121 would be:

	RGO (mg/kg)
Aroclor 1254	2.2 mg/kg
Aroclor 1260	2.2 mg/kg
B(a)P Equivalents	1.0 mg/kg

Table A.1.1 SWMU 19 Surface Soil Concentration Summary

Boring No.		Aroclor1254 mg/kg	Aroclor1260 mg/kg	As mg/kg	BEQ mg/kg	Be mg/kg	Cu mg/kg	Ni mg/kg	Zn mg/kg
019SB	1	0.02	0.02	16.5	0.36	0.33	169	12.7	250
019SB	2	0.02	0.02	12.3	0.97	0.48	264.5	24.95	415
019SB	3	0.02	0.02	21.4	0.52	0.42	241	23.1	150
019SB	4	0.02	0.40	4.7	0.42	3	1730	282	2800
019SB	5	0.02	0.11	8.8	0.54	0.56	609	52.4	503
019SB	6	0.02	0.19	5.4	0.85	0.65	699	51.4	684
019SB	7	2.30	0.56	4.1	0.43	1.2	3040	23.2	478
019SB	8	0.02	0.03	10.7	0.49	0.96	286	28.5	393
019SB	9	0.03	0.13	22.1	0.42	0.78	427	31.4	427
019SB	10	0.02	0.07	8.2	1.06	0.19	426	56.4	246
019SB	11	0.02	0.18	3.8	0.76	0.77	1120	136	1230
019SB	12	0.03	0.03	10.9	0.55	0.155	5.8	1.95	5.95
019SB	13	0.02	0.02	3	0.45	0.15	5.9	1.35	12.3
019SB	14	0.02	0.04	5.7	0.36	0.65	1510	76.55	623
019SB	16	0.02	0.02	1	0.45	0.15	3.3	2.7	16.2
019SB	17	0.02	0.09	4.1	0.49	0.51	130	18	354
019SB	18	0.02	0.37	1.3	0.80	0.65	562	99.9	762

Note: **Shaded values were not detected; value given represents ½ the SQL.**

	Log Transformed Statistics					Max. Observed	
	n	Standard Deviation	Mean	H-value	95% UCL mg/kg	Concentration mg/kg	EPC mg/kg
Aroclor 1254	17	1.151	-3.618	2.924	0.12	2.3	0.12
Aroclor 1260	17	1.185	-2.650	2.979	0.34	0.56	0.34
Arsenic	17	0.879	1.824	2.508	15.83	22.1	15.83
BAP Eq. (BEQ)	17	0.343	-0.598	1.900	0.69	1.06	0.69
Beryllium	17	0.807	-0.697	2.407	1.12	1.2	1.12
Copper	17	2.031	5.451	4.482	17826.39	3040	3040
Nickel	17	1.463	3.242	3.449	263.61	282	264
Zinc	17	1.659	5.534	3.797	4842.14	2800	2800

Table A.1.2 SWMU 19 Hazard Quotients and Incremental Lifetime Cancer Risks

Incidental Surface Soil Ingestion

Chemical	Oral RfD Used (mg/kg-day)	Oral SF Used (mg/kg-day)-1	Future Resident adult Hazard Quotient	Future Resident child Hazard Quotient	Future Resident lwa ILCR	Site Worker adult Hazard Quotient	Site Worker adult ILCR
Aroclor 1254	2E-05	2	0.0083	0.077	3.8E-07	0.0030	4.2E-08
Aroclor 1260	NA	2	ND	ND	1.1E-06	ND	1.2E-07
Arsenic	0.0003	1.5	0.072	0.67	3.7E-05	0.026	4.1E-06
BAP Eq. (BEQ)	NA	7.3	ND	ND	7.8E-06	ND	8.8E-07
Beryllium	0.005	4.3	0.00031	0.0029	7.5E-06	0.00011	8.4E-07
Copper	3.5	NA	0.0012	0.011	ND	0.00042	ND
Nickel	0.02	NA	0.018	0.17	ND	0.0064	ND
Zinc	0.3	NA	0.013	0.12	ND	0.0046	ND
Total Incidental Ingestion Pathway Risk & Hazard:			0.1	1	5E-05	0.04	6E-06

Dermal Contact With Surface Soil

Chemical	Dermal Adjustment	Oral RfD Used (mg/kg-day)	Oral SF Used (mg/kg-day)-1	Future Resident adult Hazard Quotient	Future Resident child Hazard Quotient	Future Resident lwa ILCR	Site Worker adult Hazard Quotient	Site Worker adult ILCR
Aroclor 1254	0.5	1E-05	4	0.0068	0.022	1.7E-07	0.0048	6.9E-08
Aroclor 1260	0.5	NA	4	ND	ND	4.8E-07	ND	2.0E-07
Arsenic	0.2	6E-05	7.5	0.015	0.049	4.2E-06	0.011	1.7E-06
BAP Eq. (BEQ)	0.5	NA	14.6	ND	ND	3.5E-06	ND	1.4E-06
Beryllium	0.2	0.001	21.5	0.000063	0.00021	8.5E-07	0.000045	3.5E-07
Copper	0.2	0.7	NA	0.00024	0.00081	ND	0.00017	ND
Nickel	0.2	0.004	NA	0.0037	0.012	ND	0.0026	ND
Zinc	0.2	0.06	NA	0.0026	0.0087	ND	0.0019	ND
Total Dermal Pathway Risk & Hazard:				0.03	0.09	9E-06	0.02	4E-06
Sum of All Soil Pathways:				1.4E-01	1.1E+00	6.3E-05	6.0E-02	9.8E-06

NOTES:

NA Not available

ND Not Determined due to lack of available information

ILCR Incremental Lifetime Cancer Risk

Dermal Adj. Dermal to absorbed dose adjustment factor is applied to adjust for Oral SF and RfD (i.e., the oral RfD is based on oral absorption efficiency which should not be applied to dermal exposure and dermal CDI)

Table A.1.3. SWMU 19 Point Risk Summary (1E-6)

	Aroclor 1254	Aroclor 1260	As	BEQ	Be	Cu	Ni	Zn
SF (ing)	2	2	1.5	7.3	4.3	NA	NA	NA
SF (der)	4	4	7.5	14.6	21.5	NA	NA	NA
DAF	0.01	0.01	0.001	0.01	0.001	0.001	0.001	0.001

Residential

Boring No.		Aroclor 1254	Aroclor 1260	As	BEQ	Be	Cu	Ni	Zn	Total Point Risk	Risk Above Background
019SB	1	0.1	0.1	43.1	5.9	2.5	-	-	-	51.7	2.3
019SB	2	0.1	0.1	32.1	16.1	3.6	-	-	-	52.0	9.6
019SB	3	0.1	0.1	55.9	8.6	3.1	-	-	-	67.8	17.0
019SB	4	0.1	1.8	12.3	6.9	22.5	-	-	-	43.6	13.6
019SB	5	0.1	0.5	23.0	9.0	4.2	-	-	-	36.8	2.9
019SB	6	0.1	0.9	14.1	14.1	4.9	-	-	-	34.0	8.3
019SB	7	10.4	2.5	10.7	7.1	9.0	-	-	-	39.8	13.4
019SB	8	0.1	0.1	27.9	8.0	7.2	-	-	-	43.4	1.6
019SB	9	0.1	0.6	57.7	6.9	5.8	-	-	-	71.2	17.6
019SB	10	0.1	0.3	21.4	17.5	1.4	-	-	-	40.8	11.2
019SB	11	0.1	0.8	9.9	12.5	5.8	-	-	-	29.1	6.7
019SB	12	0.1	0.1	28.5	9.2	1.2	-	-	-	39.0	2.7
019SB	13	0.1	0.1	7.8	7.5	1.1	-	-	-	16.6	0.9
019SB	14	0.1	0.2	14.9	5.9	4.9	-	-	-	25.9	0.3
019SB	16	0.1	0.1	2.6	7.5	1.1	-	-	-	11.4	0.9
019SB	17	0.1	0.4	10.7	8.1	3.8	-	-	-	23.1	1.9
019SB	18	0.1	1.7	3.4	13.2	4.9	-	-	-	23.2	8.2
Site Risk		0.5	1.6	41.3	11.4	8.4	-	-	-	63.2	-
Adj. Site Risk*		**0.5**	**1.6**	**0.3**	**4.7**	**0.0**	-	-	-	-	**7.1**

Industrial

Boring No.		Aroclor 1254	Aroclor 1260	As	BEQ	Be	Cu	Ni	Zn	Total Point Risk	Total Adj.* Point Risk
019SB	1	0.0	0.0	4.3	0.5	0.2	-	-	-	5.0	0.01
"	2	0.0	0.0	3.2	1.2	0.4	-	-	-	4.8	0.01
"	3	0.0	0.0	5.6	0.7	0.3	-	-	-	6.6	0.01
"	4	0.0	0.1	1.2	0.5	2.3	-	-	-	4.2	0.90
"	5	0.0	0.0	2.3	0.7	0.4	-	-	-	3.5	0.05
"	6	0.0	0.1	1.4	1.1	0.5	-	-	-	3.1	0.07
"	7	0.8	0.2	1.1	0.6	0.9	-	-	-	3.5	1.00
"	8	0.0	0.0	2.8	0.6	0.7	-	-	-	4.2	0.02
"	9	0.0	0.0	5.8	0.5	0.6	-	-	-	7.0	0.05
"	10	0.0	0.0	2.1	1.4	0.1	-	-	-	3.7	0.03
"	11	0.0	0.1	1.0	1.0	0 6	-	-	-	2.6	0.07
"	12	0.0	0 0	2.9	0.7	0.1	-	-	-	3.7	0.02
"	13	0.0	0.0	0.8	0.6	0.1	-	-	-	1.5	0.01
"	14	0.0	0.0	1.5	0.5	0.5	-	-	-	2.5	0.02
"	16	0.0	0.0	0.3	0.6	0.1	-	-	-	1.0	0.01
"	17	0.0	0.0	1.1	0.6	0.4	-	-	-	2.1	0.04
"	18	0.0	0.1	0.3	1.0	0 5	-	-	-	2.0	0.14
Site Risk		0.1	0.3	5.8	2.3	1.2	-	-	-	9.8	-
Adj. Site Risk*		**0.1**	**0.3**	**0.0**	**0.9**	**0.0**	-	-	-	-	**1.4**

***Adj. Site Risk = Total Site Risk minus background risk for Arsenic (Res: 41E-6; Ind: 5.8E-6), Beryllium (Res.: 11E-6; Ind.: 1.5E-6), and BEQs (Res.: 6.7E-6; Ind.: 1.4E-6)**

Table A.1.4. SWMU 19 Point Hazard Summary (1E-6)

	Aroclor 1254	Aroclor 1260	As	BEQ	Be	Cu	Ni	Zn
SF (ing.)	2	2	1.5	7.3	4.3	NA	NA	NA
SF (derm.)	4	4	7.5	14.6	21.5	NA	NA	NA
DAF	0.01	0.01	0.001	0.01	0.001	0.001	0.001	0.001
Oral RfD (ing.)	2E-05	NA	0.0003	NA	0.005	3.5	0.02	0.3
Oral RfD (derm.)	1E-05	NA	6E-05	NA	0.001	0.7	0.004	0.06

Residential

Boring No.		Aroclor 1254	Aroclor 1260	As	BEQ	Be	Cu	Ni	Zn	Total Point Hazard	Hazard Above Background*
019SB	1	0.02	NA	0.75	NA	0.00	0.00	0.01	0.01	0.8	0.05
"	2	0.02	NA	0.56	NA	0.00	0.00	0.02	0.02	0.6	0.01
"	3	0.02	NA	0.98	NA	0.00	0.00	0.02	0.01	1.0	0.27
"	4	0.02	NA	0.21	NA	0.01	0.01	0.19	0.13	0.6	0.29
"	5	0.02	NA	0.40	NA	0.00	0.00	0.04	0.02	0.5	0.03
"	6	0.02	NA	0.25	NA	0.00	0.00	0.04	0.03	0.3	0.03
"	7	1.90	NA	0.19	NA	0.00	0.01	0.02	0.02	2.1	0.01
"	8	0.02	NA	0.49	NA	0.00	0.00	0.02	0.02	0.5	0.01
"	9	0.02	NA	1.01	NA	0.00	0.00	0.02	0.02	1.1	0.31
"	10	0.02	NA	0.37	NA	0.00	0.00	0.04	0.01	0.4	0.02
"	11	0.02	NA	0.17	NA	0.00	0.00	0.09	0.06	0.3	0.12
"	12	0.02	NA	0.50	NA	0.00	0.00	0.00	0.00	0.5	0.00
"	13	0.02	NA	0.14	NA	0.00	0.00	0.00	0.00	0.2	0.00
"	14	0.01	NA	0.26	NA	0.00	0.01	0.05	0.03	0.4	0.05
"	16	0.02	NA	0.05	NA	0.00	0.00	0.00	0.00	0.1	0.00
"	17	0.02	NA	0.19	NA	0.00	0.00	0.01	0.02	0.2	0.01
"	18	0.02	NA	0.06	NA	0.00	0.00	0.07	0.03	0.2	0.07
Site Hazard		0.08	NA	0.69	NA	0.00	0.01	0.17	0.12	1.1	-
Site Hazard Above Bkgd.		**0.08**	**NA**	**0.00**	**NA**	**0.00**	**0.00**	**0.15**	**0.11**	-	**0.35**

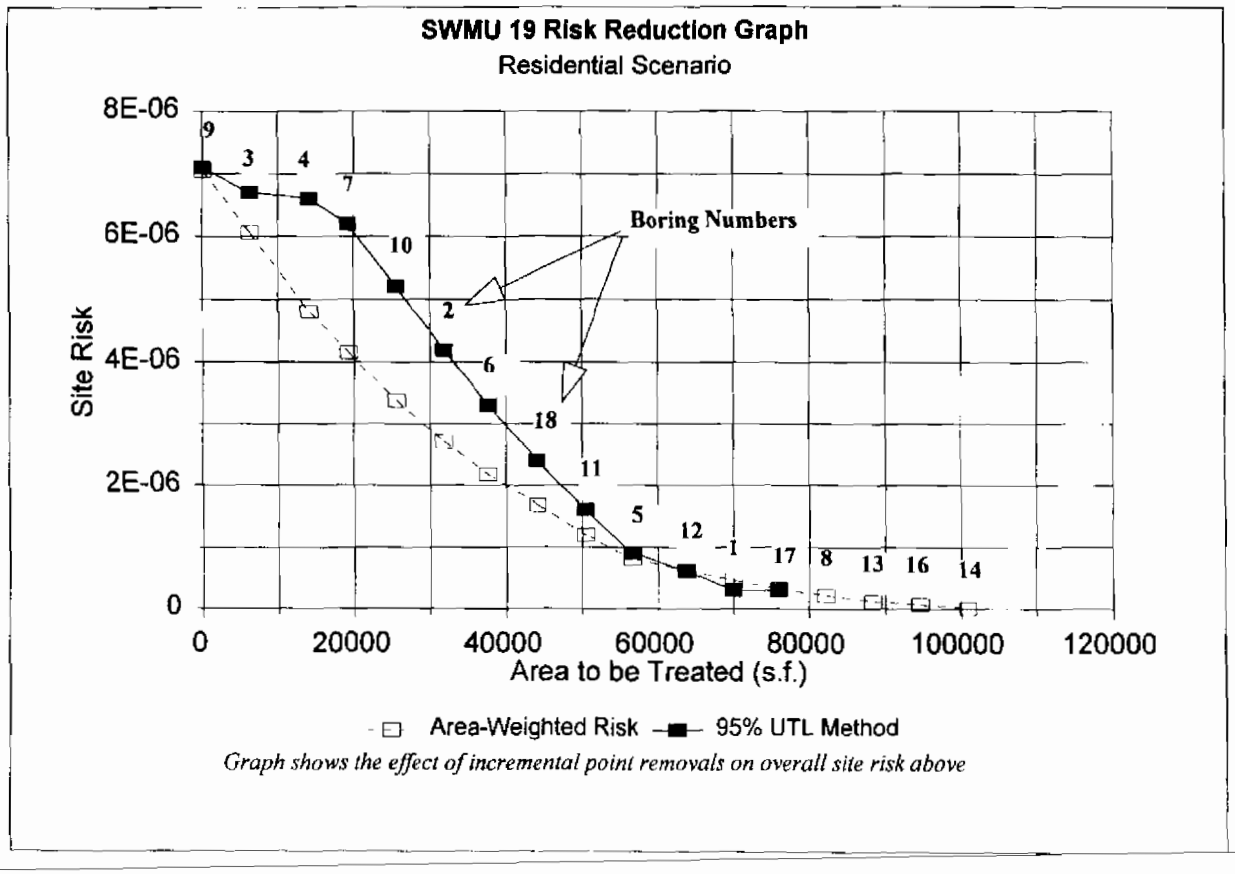
Industrial

Boring No.		Aroclor 1254	Aroclor 1260	As	BEQ	Be	Cu	Ni	Zn	Total Point Hazard	Hazard Above Background*
019SB	1	0.00	NA	0.04	NA	0.00	0.00	0.00	0.00	0.0	0.00
"	2	0.00	NA	0.03	NA	0.00	0.00	0.00	0.00	0.0	0.00
"	3	0.00	NA	0.05	NA	0.00	0.00	0.00	0.00	0.1	0.00
"	4	0.00	NA	0.01	NA	0.00	0.00	0.01	0.01	0.0	0.00
"	5	0.00	NA	0.02	NA	0.00	0.00	0.00	0.00	0.0	0.00
"	6	0.00	NA	0.01	NA	0.00	0.00	0.00	0.00	0.0	0.00
"	7	0.15	NA	0.01	NA	0.00	0.00	0.00	0.00	0.2	0.00
"	8	0.00	NA	0.02	NA	0.00	0.00	0.00	0.00	0.0	0.00
"	9	0.00	NA	0.05	NA	0.00	0.00	0.00	0.00	0.1	0.00
"	10	0.00	NA	0.02	NA	0.00	0.00	0.00	0.00	0.0	0.00
"	11	0.00	NA	0.01	NA	0.00	0.00	0.00	0.00	0.0	0.00
"	12	0.00	NA	0.03	NA	0.00	0.00	0.00	0.00	0.0	0.00
"	13	0.00	NA	0.01	NA	0.00	0.00	0.00	0.00	0.0	0.00
"	14	0.00	NA	0.01	NA	0.00	0.00	0.00	0.00	0.0	0.00
"	16	0.00	NA	0.00	NA	0.00	0.00	0.00	0.00	0.0	0.00
"	17	0.00	NA	0.01	NA	0.00	0.00	0.00	0.00	0.0	0.00
"	18	0.00	NA	0.00	NA	0.00	0.00	0.00	0.00	0.0	0.00
Site Hazard		0.01	NA	0.04	NA	0.00	0.00	0.01	0.01	0.1	-
Site Hazard Above Bkgd.		**0.01**	**NA**	**0.00**	**NA**	**0.00**	**0.00**	**0.01**	**0.01**	-	**0.02**

***Adj. Site Hazard = Total Site Hazard minus background hazard for Arsenic (Res: 0.71; Ind: 0.04), Beryllium (Res.: 0.0038; Ind.: app. 0), Copper (Res.: 0.0095; Ind. app. 0), Nickel (Res.: 0.023; Ind. app. 0), and Zinc (Res.: 0.0098; Ind. app. 0)**

Table A.1.5 SWMU 19 Residential Point Risk Reduction (1E-6)

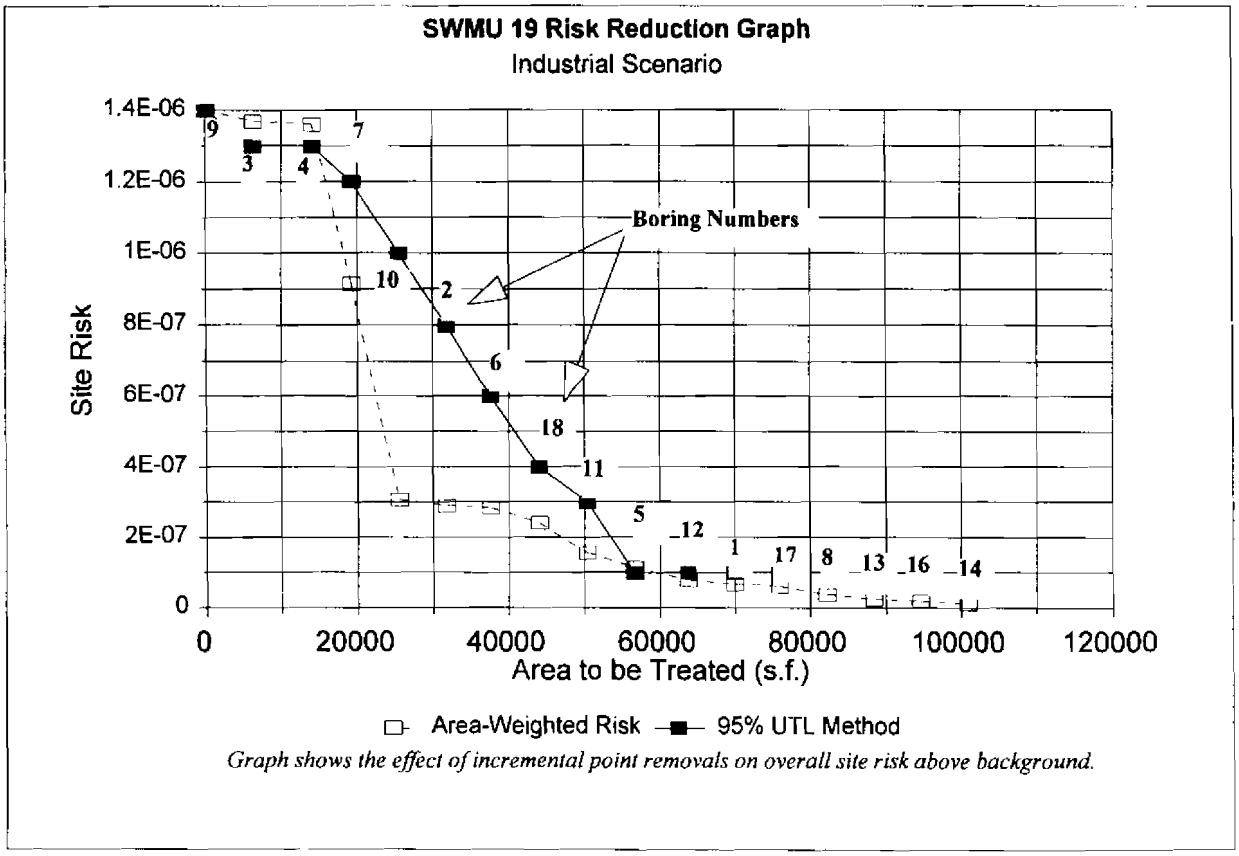
Point to be Removed		Estimated Area (s.f.)	Cumul. Area	Individual Point Risks		Area Weighted Point Risks		Site Risk Remaining After Point Removal		
				Total	Above Bkgd.	Total	Above Bkgd.	Total	A-W Above Bkgd.	UTL Above Bkgd.
SB019	9	6250	6250	71.2	17.6	6.8	1.0	56.4	6.1	6.7
"	3	7895	14145	67.8	17.0	8.2	1.3	48.2	4.8	6.6
"	4	5125	19270	43.6	13.6	3.4	0.7	44.8	4.2	6.2
"	7	6250	25520	39.8	13.4	3.8	0.8	41.0	3.4	5.2
"	10	6250	31770	40.8	11.2	3.9	0.7	37.0	2.7	4.2
"	2	5838	37607	52.0	9.6	4.6	0.5	32.4	2.2	3.3
"	6	6509	44116	34.0	8.3	3.4	0.5	29.0	1.7	2.4
"	18	6250	50366	23.2	8.2	2.2	0.5	26.8	1.2	1.6
"	11	6250	56616	29.1	6.7	2.8	0.4	24.0	0.8	0.9
"	5	7116	63732	36.8	2.9	4.0	0.2	20.0	0.6	0.6
"	12	6250	69982	39.0	2.7	3.7	0.2	16.3	0.5	0.3
"	1	5896	75878	51.7	2.3	4.7	0.1	11.6	0.3	0.3
"	17	6250	82128	23.1	1.9	2.2	0.1	9.4	0.2	0
"	8	6250	88378	43.4	1.6	4.2	0.1	5.2	0.1	0
"	13	6250	94628	16.6	0.9	1.6	0.1	3.6	0.1	0
"	16	6250	100878	11.4	0.9	1.1	0.1	2.5	0.0	0
"	14	6399	107277	25.9	0.3	2.5	0.0	-0.0	-0.0	0



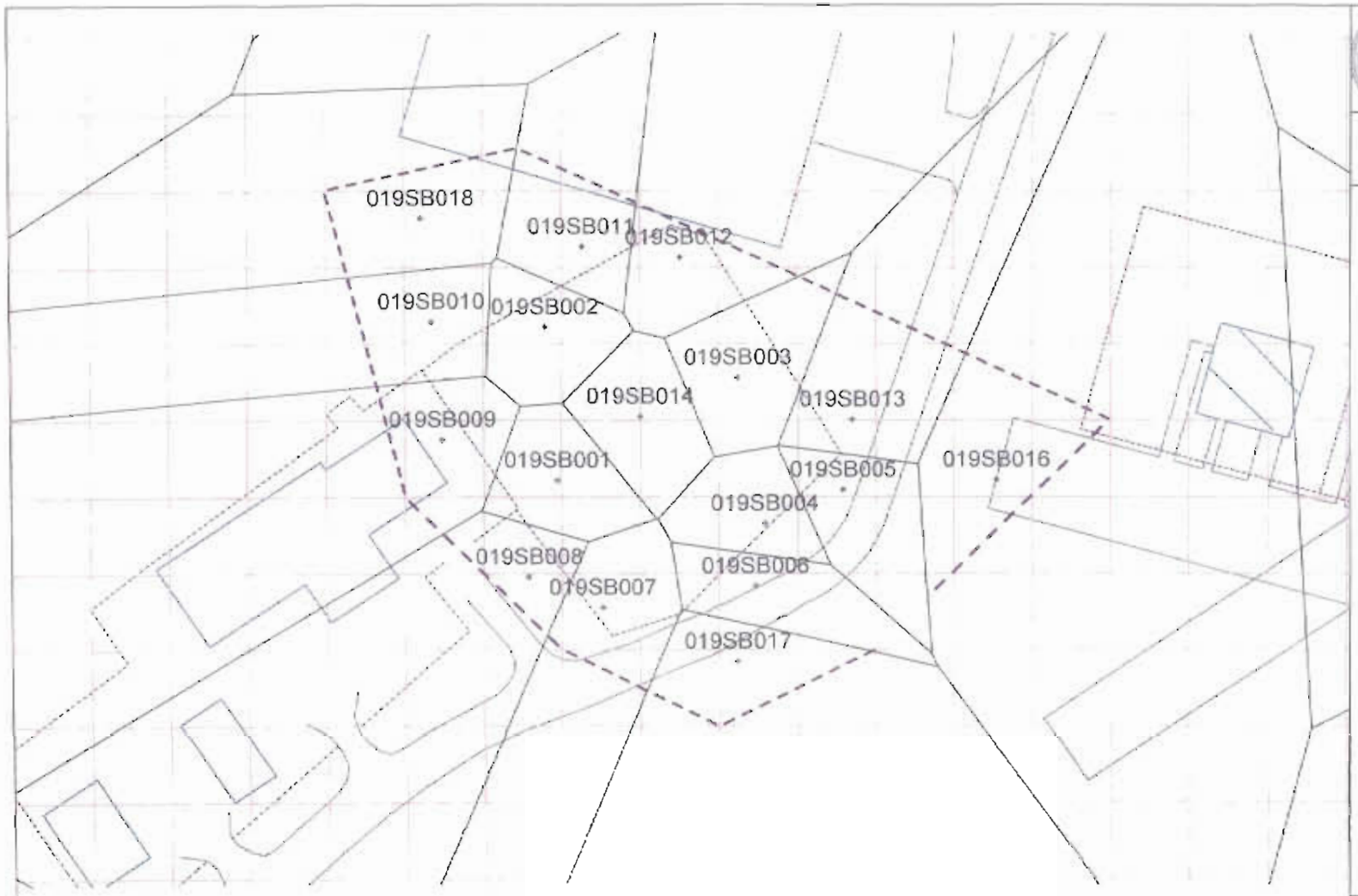
Graph shows the effect of incremental point removals on overall site risk above

Table A.1.6 SWMU 19 Industrial Point Risk Reduction (1E-6)

Point to be Removed		Estimated Area (s.f.)	Cumul. Area	Individual Point Risks		Area Weighted Point Risks		Site Risk Remaining After Point Removal		
				Total	Above Bkgd.	Total	Above Bkgd.	Total	A-W Above Bkgd.	UTL Above Bkgd.
SB019	9	6250	6250	7.0	0.05	1.1	0.0	8.7	1.4	1.3
"	3	7895	14145	6.6	0.01	1.3	0.0	7.3	1.4	1.3
"	4	5125	19270	4.2	0.90	0.6	0.4	6.8	0.9	1.2
"	7	6250	25520	3.5	1.00	0.6	0.6	6.2	0.3	1
"	10	6250	31770	2.6	0.03	0.4	0.0	5.8	0.3	0.8
"	2	5838	37607	4.8	0.01	0.7	0.0	5.1	0.3	0.6
"	6	6509	44116	3.1	0.07	0.5	0.0	4.6	0.2	0.4
"	18	6250	50366	2.0	0.14	0.3	0.1	4.2	0.2	0.3
"	11	6250	56616	2.6	0.07	0.4	0.0	3.8	0.1	0.1
"	5	7116	63732	3.5	0.05	0.6	0.0	3.2	0.1	0.1
"	12	6250	69982	3.7	0.02	0.6	0.0	2.6	0.1	0.1
"	1	5896	75878	5.0	0.01	0.8	0.0	1.8	0.1	0.1
"	17	6250	82128	2.1	0.04	0.3	0.0	1.5	0.0	0
"	8	6250	88378	4.2	0.02	0.7	0.0	0.8	0.0	0
"	13	6250	94628	1.5	0.01	0.2	0.0	0.6	0.0	0
"	16	6250	100878	1.0	0.01	0.2	0.0	0.4	0.0	0
"	14	6399	107277	2.5	0.02	0.4	0.0	0.0	-0.0	0



Graph shows the effect of incremental point removals on overall site risk above background.



Charleston Naval Base
Zone H
Corrective Measures
Work Plan

Site 19
Risk – Thiessen Polygons

Soil_pts.shp
Soil Sample Locations
Soil_the.shp
Risk – Thiessen polygons
Grid_50.shp
50 -Foot Grid
Water
Pier
Road
Bldg
Fence

N
W
E
S

1:70

Table A.2.1 SWMU 20 Surface Soil Concentration Summary

Boring No.		BEQ mg/kg
020SB	1	0.49
020SB	2	0.62
"	3	0.45
"	4	0.32
"	5	1.27
"	6	0.46
"	7	0.40
"	8	0.83
"	9	0.80
"	10	0.39
"	11	1.50

	Log Transformed Statistics					Max. Observed	
	n	Standard Deviation	Mean	H-value	95% UCL mg/kg	Concentration mg/kg	EPC mg/kg
BAP Eq. (BEQ)	11	0.504	-0.504	2.186	0.97	1.50215	0.97

Table A.2.2 SWMU 20 Hazard Quotients and Incremental Lifetime Cancer Risks

Incidental Surface Soil Ingestion

Chemical	Oral RfD Used (mg/kg-day)	Oral SF Used (mg/kg-day)-1	Future Resident adult Hazard Quotient	Future Resident child Hazard Quotient	Future Resident Iwa ILCR	Site Worker adult Hazard Quotient	Site Worker adult ILCR
Benzo(a)pyrene equiv.	NA	7.3	ND	ND	1.1E-05	ND	1.2E-06

Dermal Contact With Surface Soil

Chemical	Dermal Adjustment	Oral RfD Used (mg/kg-day)	Oral SF Used (mg/kg-day)-1	Future Resident adult Hazard Quotient	Future Resident child Hazard Quotient	Future Resident Iwa ILCR	Site Worker adult Hazard Quotient	Site Worker adult ILCR
Benzo(a)pyrene equiv.	0.5	NA	14.6	ND	ND	5.0E-06	ND	2.0E-06
Sum of All Soil Pathways:				ND	ND	1.6E-05	ND	3.3E-06

NOTES:

NA Not available

ND Not Determined due to lack of available information

ILCR Incremental Lifetime Cancer Risk

Dermal Adj. Dermal to absorbed dose adjustment factor is applied to adjust for Oral SF and RfD (i.e., the oral RfD is based on oral absorption efficiency which should not be applied to dermal exposure and dermal CDI)

Table A.2.3. SWMU 20 Point Risk Summary (1E-6)

	Aroclor 1254	Aroclor 1260	As	BEQ	Be	Cu	Ni	Zn
SF (ing)	2	2	1.5	7.3	4.3	NA	NA	NA
SF (der)	4	4	7.5	14.6	21.5	NA	NA	NA
DAF	0.01	0.01	0.001	0.01	0.001	0.001	0.001	0.001

Residential

Boring No.		Aroclor 1254	Aroclor 1260	As	BEQ	Be	Cu	Ni	Zn	Total Point Risk	Risk Above Background
020SB	1	-	-	-	8.2	-	-	-	-	8.2	1.5
020SB	2	-	-	-	10.2	-	-	-	-	10.2	3.5
"	3	-	-	-	7.4	-	-	-	-	7.4	0.7
"	4	-	-	-	5.2	-	-	-	-	5.2	0.0
"	5	-	-	-	21.0	-	-	-	-	21.0	14.3
"	6	-	-	-	7.6	-	-	-	-	7.6	0.9
"	7	-	-	-	6.6	-	-	-	-	6.6	0.0
"	8	-	-	-	13.7	-	-	-	-	13.7	7.0
"	9	-	-	-	13.2	-	-	-	-	13.2	6.5
"	10	-	-	-	6.5	-	-	-	-	6.5	0.0
"	**11****	-	-	-	**24.9**	-	-	-	-	**24.9**	**18.2**
Site Risk		-	-	-	16.1	-	-	-	-	16.1	-
Adj. Site Risk*		-	-	-	**9.4**	-	-	-	-	-	**9.4**

Industrial

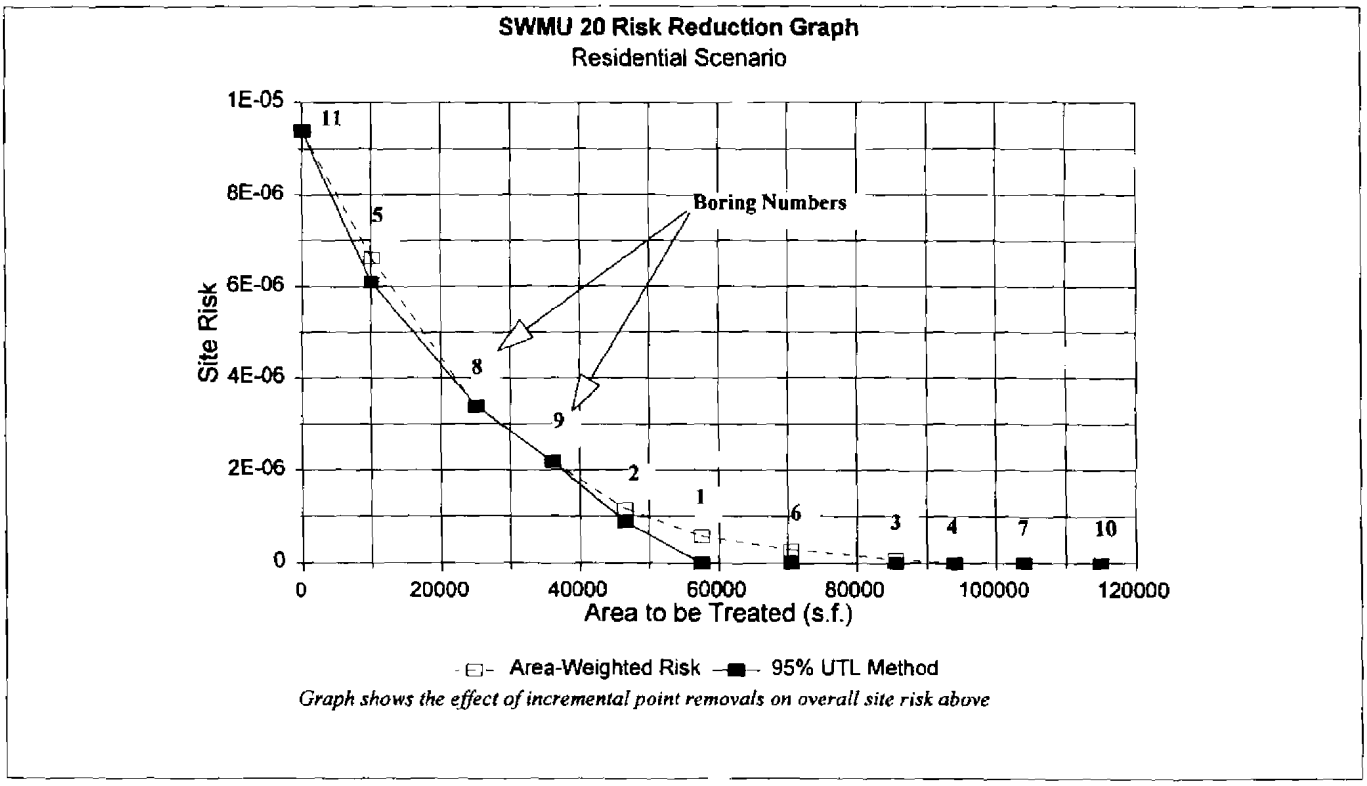
Boring No.		Aroclor 1254	Aroclor 1260	As	BEQ	Be	Cu	Ni	Zn	Total Point Risk	Risk Above Background
020SB	1	-	-	-	0.6	-	-	-	-	0.6	0.00
020SB	2	-	-	-	0.8	-	-	-	-	0.8	0.00
"	3	-	-	-	0.6	-	-	-	-	0.6	0.00
"	4	-	-	-	0.4	-	-	-	-	0.4	0.00
"	5	-	-	-	1.6	-	-	-	-	1.6	0.22
"	6	-	-	-	0.6	-	-	-	-	0.6	0.00
"	7	-	-	-	0.5	-	-	-	-	0.5	0.00
"	8	-	-	-	1.1	-	-	-	-	1.1	0.00
"	9	-	-	-	1.0	-	-	-	-	1.0	0.00
"	10	-	-	-	0.5	-	-	-	-	0.5	0.00
"	11**	-	-	-	1.9	-	-	-	-	1.9	0.52
Site Risk		-	-	-	3.3	-	-	-	-	3.3	-
Adj. Site Risk*		-	-	-	**1.9**	-	-	-	-	-	**1.9**

***Adj. Site Risk = Total Site Risk minus background risk for Arsenic (Res: 41E-6; Ind: 5.8E-6), Beryllium (Res.: 11E-6; Ind.: 1.5E-6), and BEQs (Res.: 6.7E-6; Ind.: 1.4E-6)**

**** = Sample point 11 was non-detect, however the quantification limit was set at 1300 ug/kg.**

Table A.2.4 SWMU 20 Residential Point Risk Reduction (1E-6)

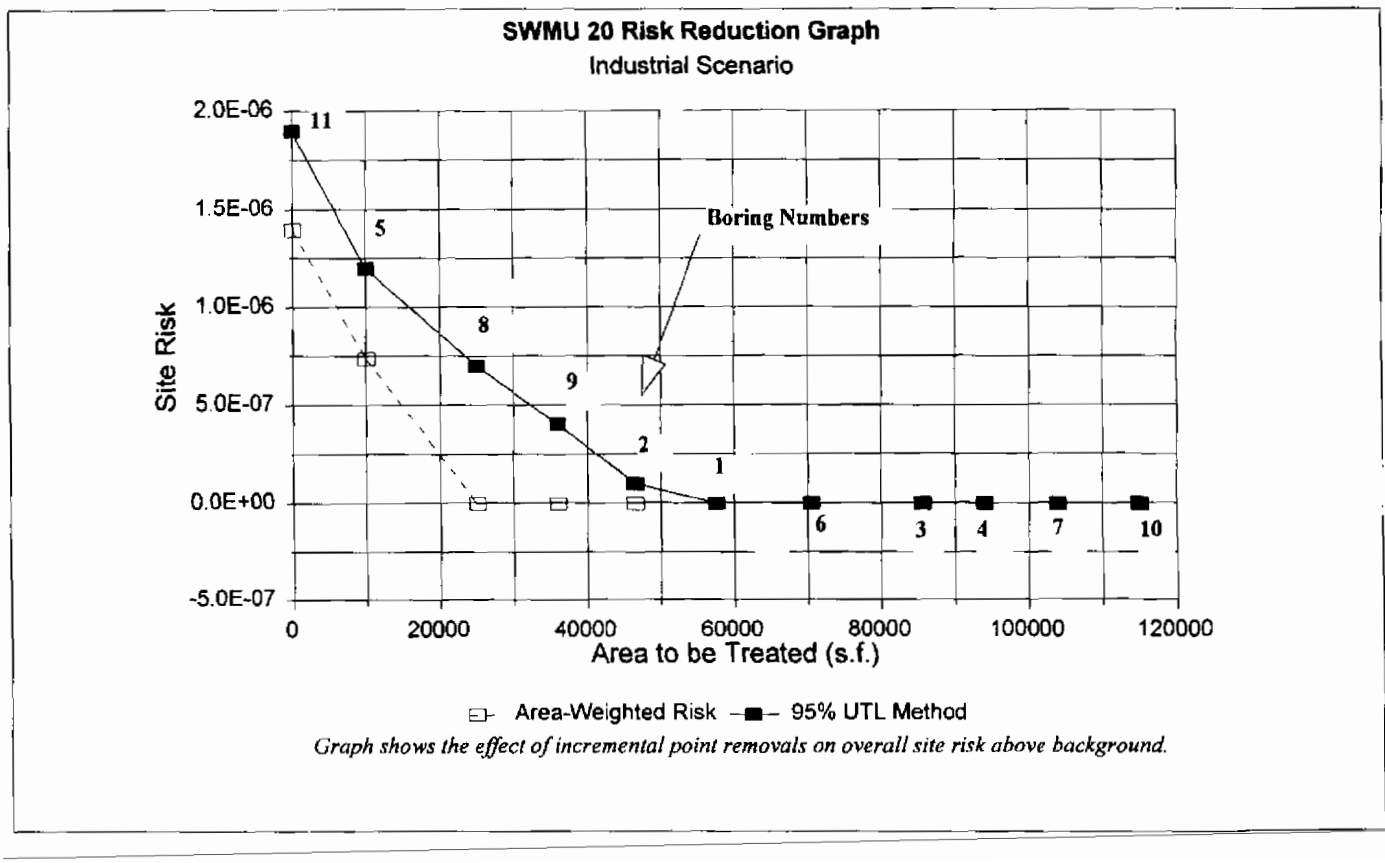
Point to be Removed		Estimated Area (s.f.)	Cumul. Area	Individual Point Risks		Area Weighted Point Risks		Site Risk Remaining After Point Removal		
				Total	Above Bkgd.	Total	Above Bkgd.	Total	AW Method Above Bkgd.	UCL Method Above Bkgd.
020SB	11	10000	10000	24.9	18.18	2.7	2.8	13.3	6.6	6.1
020SB	5	15000	25000	21.0	14.30	3.5	3.3	9.8	3.4	3.4
020SB	8	11000	36000	13.7	7.05	1.7	1.2	8.2	2.2	2.2
020SB	9	10477	46477	13.2	6.48	1.5	1.0	6.6	1.2	0.9
020SB	2	11000	57477	10.2	3.53	1.2	0.6	5.4	0.6	0
020SB	1	13000	70477	8.2	1.49	1.2	0.3	4.2	0.3	0
020SB	6	15000	85477	7.6	0.89	1.3	0.2	3.0	0.1	0
020SB	3	8427	93904	7.4	0.70	0.7	0.1	2.3	0.0	0
020SB	4	10000	103904	5.2	0.00	0.6	0.0	1.7	0.0	0
020SB	7	11000	114904	6.6	0.00	0.8	0.0	0.9	0.0	0
020SB	10	13000	127904	6.5	0.00	0.9	0.0	0.0	0.0	0



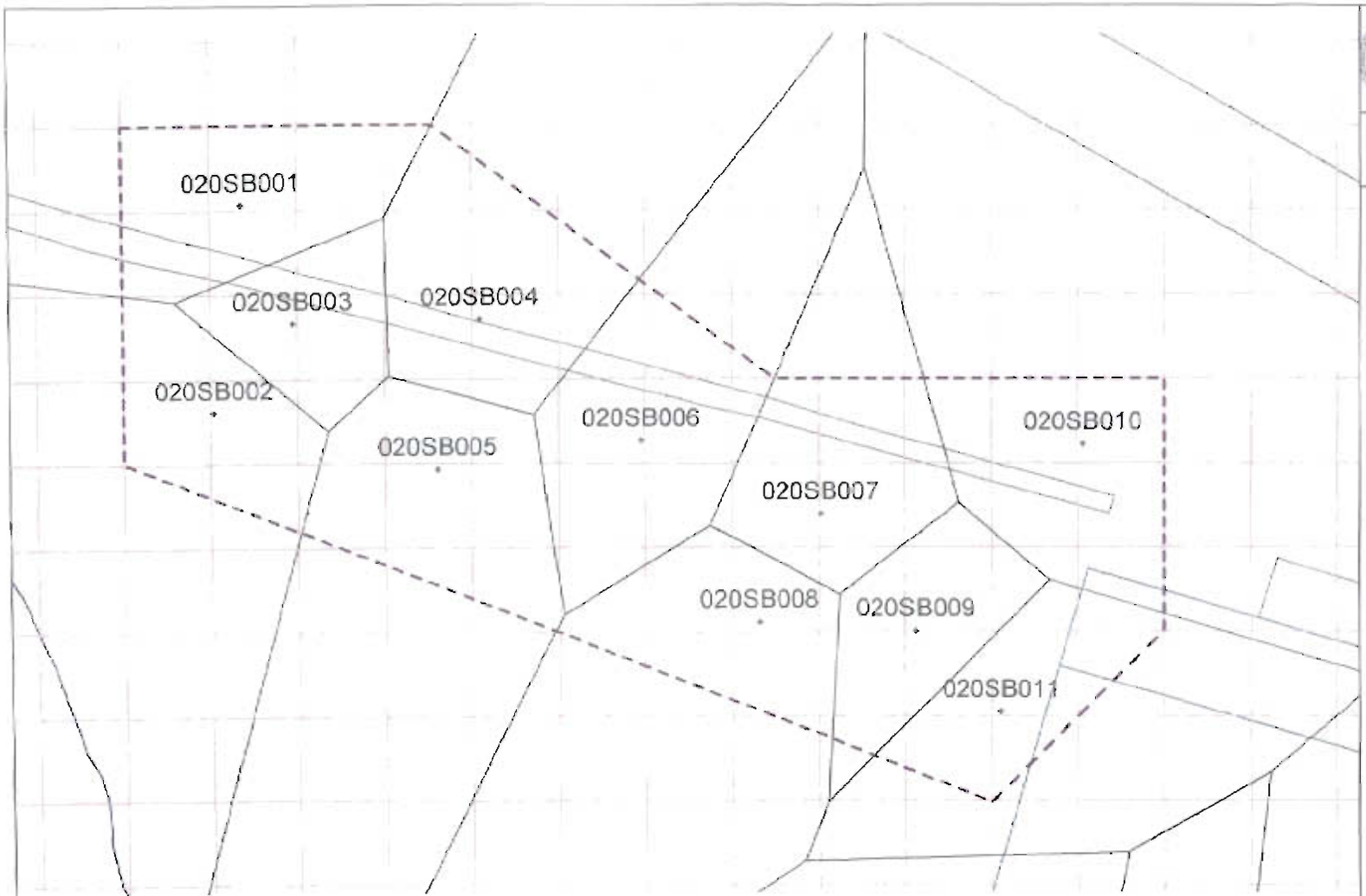
Graph shows the effect of incremental point removals on overall site risk above

Table A.2.5 SWMU 20 Industrial Point Risk Reduction (1E-6)

Point to be Removed		Estimated Area (s.f.)	Cumul. Area	Individual Point Risks		Area Weighted Point Risks		Site Risk Remaining After Point Removal		
				Total	Above Bkgd.	Total	Above Bkgd.	Total	AW Method Above Bkgd.	UCL Method Above Bkgd.
020SB	11	10000	10000	1.9	0.52	0.6	1.2	2.7	0.7	1.2
020SB	5	15000	25000	1.6	0.22	0.7	0.7	2.0	-0.0	0.7
020SB	8	11000	36000	1.1	0.00	0.4	0.0	1.7	-0.0	0.4
020SB	9	10477	46477	1.0	0.00	0.3	0.0	1.4	-0.0	0.1
020SB	2	11000	57477	0.8	0.00	0.3	0.0	1.1	-0.0	0
020SB	1	13000	70477	0.6	0.00	0.2	0.0	0.9	-0.0	0
020SB	6	15000	85477	0.6	0.00	0.3	0.0	0.6	-0.0	0
020SB	3	8427	93904	0.6	0.00	0.1	0.0	0.5	-0.0	0
020SB	4	10000	103904	0.4	0.00	0.1	0.0	0.4	-0.0	0
020SB	7	11000	114904	0.5	0.00	0.2	0.0	0.2	-0.0	0
020SB	10	13000	127904	0.5	0.00	0.2	0.0	-0.0	-0.0	0



Graph shows the effect of incremental point removals on overall site risk above background.



Charleston Naval Base
Zone H
Corrective Measures
Work Plan

Site 20
Risk -- Thiessen Polygons

Soil_pts.shp
Soil Sample Locations
Soil_the.shp
Risk -- Thiessen polygons
Grid_50.shp
50 -Foot Grid
Water
Pier
Road
Bldg
Fence

N
W
E
S

1:64

Table A.3.1. SWMU 121 Surface Soil Concentration Summary

Boring No.		Aroclor1254 mg/kg	Aroclor1260 mg/kg	As mg/kg	BEQ mg/kg	Be mg/kg	Cu mg/kg	Ni mg/kg	Zn mg/kg	Sb	Hg	Tl	V
121SB	1	0.02	0.02	4	0.42	0.52	60	14	305	3.60	0.11	2.7	7
121SB	2	0.84	0.12	5	0.33	0.63	460	192	2835	3	3.50	0.55	359
121SB	3	0.02	0.11	12	0.49	1.70	455	113	1250	5	0.29	0.43	24
121SB	4	0.02	0.12	19	0.32	4.80	1360	374	4470	3	0.96	0.34	76
121SB	5	0.02	0.02	5	1.85	0.81	460	88	689	7	0.27	0.85	33
121SB	6	0.14	0.13	9	0.48	4.70	1690	383	4520	7.60	0.85	0.33	94
121SB	7	0.21	0.33	6	0.36	14.60	4060	995	15100	6.40	3.30	1.25	470
121SB	8	0.02	0.02	11	0.50	0.91	74	27	253	0.95	0.03	0.34	12
121SB	9	0.24	0.47	8	0.81	3.20	984	217	3170	9.45	0.98	0.31	60
121SB	10	0.35	0.53	7	0.93	1.70	585	164	1910	4.45	1.10	0.30	41
121SB	11	0.32	0.70	9	2.52	2.00	762	154	2110	6.40	1.10	0.34	119
121SB	13	0.02	0.02	4.95	2.11	0.76	239	49	536	0.50	0.29	0.16	30
121SB	14	0.02	0.11	2.70	0.37	4.10	883	259	3840	0.70	0.98	0.50	94
121SB	15	0.02	0.12	0.80	0.53	1.40	734	127	1600	2.10	0.26	0.18	27
121SB	16	4.30	1.10	6.75	0.91	4.60	1090	240	3180	1.70	1.40	0.35	39
121SB	17	0.02	0.17	1.20	0.49	0.16	13.80	5	79	0.50	0.05	0.16	6

Note: shaded values were not detected; value given represents ½ the SQL.

	n	og Transformed Dat standard deviation	mean	H-value	95% UCL mg/kg	Max mg/kg	EPC mg/kg
Aroclor 1254	16	1.747	-2.579	4.015	2.13	4.3	2.13
Aroclor 1260	16	1.318	-2.062	3.243	0.91	1.1	0.91
Arsenic	16	0.819	1.696	2.447	12.78	18.7	12.78
B(a)P Eq. (BEQ)	16	0.675	-0.422	2.256	1.22	2.5249	1.22
Beryllium	16	1.111	0.529	2.896	7.22	14.6	7.22
Copper	16	1.416	6.132	3.415	4378.67	4060	4060
Nickel	16	1.350	4.749	3.298	905.46	995	905
Zinc	16	1.327	7.308	3.258	10985.38	15100	10985
Antimony	16	0.990	0.999	2.699	8.84	9.45	8.84
Mercury	16	1.370	-0.696	3.333	4.14	3.5	3.50
Thallium	16	0.747	-0.893	2.349	0.85	2.7	0.85
Vanadium	16	1.227	3.827	3.085	259.00	470	259.00

Table A.3.2 SWMU 121 Hazard Quotients and Incremental Lifetime Cancer Risks

Incidental Surface Soil Ingestion

Chemical	Oral RfD Used (mg/kg-day)	Oral SF Used (mg/kg-day)-1	Future Resident adult Hazard Quotient	Future Resident child Hazard Quotient	Future Resident lwa ILCR	Site Worker adult Hazard Quotient	Site Worker adult ILCR
Aroclor 1254	2E-05	2	0.1462	1.365	6.7E-06	0.0522	7.5E-07
Aroclor 1260	NA	2	ND	ND	2.9E-06	ND	3.2E-07
Arsenic	0.0003	1.5	0.058	0.54	3.0E-05	0.021	3.3E-06
Benzo(a)pyrene equiv.	NA	7.3	ND	ND	1.4E-05	ND	1.6E-06
Beryllium	0.005	4.3	0.00198	0.0185	4.9E-05	0.00071	5.4E-06
Copper	3.5	NA	0.0016	0.015	ND	0.00057	ND
Nickel	0.02	NA	0.062	0.58	ND	0.0221	ND
Zinc	0.3	NA	0.050	0.47	ND	0.0179	ND
Antimony	0.0004	NA	0.030	0.28	ND	0.0108	ND
Mercury	0.0003	NA	0.016	0.15	ND	0.0057	ND
Thallium	8E-05	NA	0.015	0.14	ND	0.0052	ND
Vanadium	0.007	NA	0.051	0.47	ND	0.0181	ND
Total Incidental Ingestion Pathway Risk & Hazard:			0.43	4.03	1E-04	0.15	1E-05

Dermal Contact With Surface Soil

Chemical	Dermal Adjustment	Oral RfD Used (mg/kg-day)	Oral SF Used (mg/kg-day)-1	Future Resident adult Hazard Quotient	Future Resident child Hazard Quotient	Future Resident lwa ILCR	Site Worker adult Hazard Quotient	Site Worker adult ILCR
Aroclor 1254	0.5	1E-05	4	0.1199	0.396	3.0E-06	0.0856	1.2E-06
Aroclor 1260	0.5	NA	4	ND	ND	1.3E-06	ND	5.2E-07
Arsenic	0.2	6E-05	7.5	0.012	0.039	3.4E-06	0.009	1.4E-06
Benzo(a)pyrene equiv.	0.5	NA	14.6	ND	ND	6.3E-06	ND	2.5E-06
Beryllium	0.2	0.001	21.5	0.000406	0.00134	5.5E-06	0.000290	2.2E-06
Copper	0.2	0.7	NA	0.00033	0.00108	ND	0.00023	ND
Nickel	0.2	0.004	NA	0.0127	0.042	ND	0.0091	ND
Zinc	0.2	0.06	NA	0.0103	0.0339	ND	0.0073	ND
Antimony	0.2	8E-05	NA	0.0062	0.0205	ND	0.0044	ND
Mercury	0.2	6E-05	NA	0.0033	0.0108	ND	0.0023	ND
Thallium	0.2	1.6E-05	NA	0.0030	0.0099	ND	0.0021	ND
Vanadium	0.2	0.0014	NA	0.0104	0.0343	ND	0.0074	ND
Total Dermal Pathway Risk & Hazard:				0.18	0.59	2E-05	0.13	8E-06
Sum of All Soil Pathways:				0.61	4.62	1.2E-04	0.28	1.9E-05

NOTES:

NA Not available

ND Not Determined due to lack of available information

ILCR Incremental Lifetime Cancer Risk

Dermal Adj. Dermal to absorbed dose adjustment factor is applied to adjust for Oral SF and RfD (i.e., the oral RfD is based on oral absorption efficiency which should not be applied to dermal exposure and dermal CDI)

Table A.3.3. SWMU 121 Point Risk (1E-6)

	Aroclor 1254	Aroclor 1260	As	BEQ	Be	Cu	Ni	Zn	Sb	Hg	Tl	V
SF (ing)	2	2	1.5	7.3	4.3	NA	NA	NA	NA	NA	NA	NA
SF (der)	4	4	7.5	14.6	21.5	NA	NA	NA	NA	NA	NA	NA
DAF	0.01	0.01	0.001	0.01	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001

Residential

Boring No.		Aroclor 1254	Aroclor 1260	As	BEQ	Be	Cu	Ni	Zn	Sb	Hg	Tl	V	Total Point Risk	Risk Above Background
121SB	1	0.1	0.1	9.1	6.9	3.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	20.1	0.4
121SB	2	3.8	0.5	13.8	5.5	4.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	28.4	4.4
121SB	3	0.1	0.5	31.3	8.0	12.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	52.7	3.7
121SB	4	0.1	0.5	48.8	5.2	35.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	90.7	33.4
121SB	5	0.1	0.1	14.1	30.6	6.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	51.0	24.1
121SB	6	0.6	0.6	23.5	7.9	35.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	67.8	26.6
121SB	7	1.0	1.5	16.2	5.9	109.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	133.9	100.8
121SB	8	0.1	0.1	27.9	8.2	6.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	43.2	1.7
121SB	9	1.1	2.1	20.9	13.5	24.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	61.5	22.9
121SB	10	1.6	2.4	19.3	15.4	12.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	51.4	14.4
121SB	11	1.5	3.2	23.0	41.8	15.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	84.4	43.7
121SB	13	0.1	0.1	12.9	34.9	5.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	53.7	28.4
121SB	14	0.1	0.5	7.1	6.1	30.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	44.5	20.3
121SB	15	0.1	0.5	2.1	8.8	10.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	22.0	2.7
121SB	16	19.5	5.0	17.6	15.0	34.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	91.6	56.3
121SB	17	0.1	0.8	3.1	8.0	1.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	13.2	2.2
Site Risk		9.7	4.1	33.4	20.2	54.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	121.5	-
Adj. Site Risk*		**9.7**	**4.1**	**0.0**	**13.6**	**43.1**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	-	**70.4**

Industrial

Boring No.		Aroclor 1254	Aroclor 1260	As	BEQ	Be	Cu	Ni	Zn	Sb	Hg	Tl	V	Total Point Risk	Risk Above Background
121SB	1	0.0	0.0	0.9	0.5	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.9	0.0
"	2	0.3	0.0	1.4	0.4	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.6	0.3
"	3	0.0	0.0	3.1	0.6	1.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.1	0.0
"	4	0.0	0.0	4.9	0.4	3.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	9.0	2.2
"	5	0.0	0.0	1.4	2.4	0.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.4	1.0
"	6	0.0	0.0	2.4	0.6	3.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6.6	2.1
"	7	0.1	0.1	1.6	0.5	11.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	13.2	9.7
"	8	0.0	0.0	2.8	0.6	0.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.1	0.0
"	9	0.1	0.2	2.1	1.0	2.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.8	1.2
"	10	0.1	0.2	1.9	1.2	1.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.7	0.3
"	11	0.1	0.2	2.3	3.2	1.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	7.4	2.2
"	12	0.0	0.0	1.3	2.7	0.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.6	1.3
"	13	0.0	0.0	0.7	0.5	3.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.3	1.6
"	14	0.0	0.0	0.2	0.7	1.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.0	0.0
"	16	1.5	0.4	1.8	1.2	3.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	8.3	3.8
"	17	0.0	0.1	0.3	0.6	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.1	0.1
Site Risk		2.0	0.8	4.7	4.1	7.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	19.3	-
Adj. Site Risk*		**2.0**	**0.8**	**0.0**	**2.7**	**6.2**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	-	**11.7**

***Adj. Site Risk = Total Site Risk minus background risk for Arsenic (Res: 41E-6; Ind: 6.8E-6), Beryllium (Res.: 11E-6; Ind.: 1.5E-6), and BEQs (Res.: 6.7E-6; Ind.: 1.4E-6)**

Table A.3.4. SWMU 121 Point Hazard

	Aroclor 1254	Aroclor 1260	As	BEQ	Be	Cu	Ni	Zn	Sb	Hg	Tl	V
SF (ing.)	2	2	1.5	7.3	4.3	NA	NA	NA	NA	NA	NA	NA
SF (derm.)	4	4	7.5	14.6	21.5	NA	NA	NA	NA	NA	NA	NA
DAF	0.01	0.01	0.001	0.01	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
Oral RfD (ing.)	2E-05	NA	0.0003	NA	0.005	3.5	0.02	0.3	4E-04	3E-04	8E-05	7E-03
Oral RfD (derm.)	1E-05	NA	6E-05	NA	0.001	0.7	0.004	0.06	8E-05	6E-05	2E-05	1E-03

Residential

Boring No.		Aroclor 1254	Aroclor 1260	As	BEQ	Be	Cu	Ni	Zn	Sb	Hg	Tl	V	Total Point Hazard	Hazard Above Background
121SB	1	0.02	NA	0.16	NA	0.00	0.00	0.01	0.01	0.12	0.01	0.46	0.01	0.8	0.42
121SB	2	0.69	NA	0.24	NA	0.00	0.00	0.13	0.13	0.11	0.16	0.09	0.70	2.3	1.73
121SB	3	0.02	NA	0.55	NA	0.00	0.00	0.08	0.06	0.17	0.01	0.07	0.05	1.0	0.29
121SB	4	0.02	NA	0.85	NA	0.01	0.01	0.26	0.20	0.10	0.04	0.06	0.15	1.7	0.73
121SB	5	0.02	NA	0.25	NA	0.00	0.00	0.06	0.03	0.25	0.01	0.15	0.06	0.8	0.33
121SB	6	0.12	NA	0.41	NA	0.01	0.01	0.26	0.21	0.26	0.04	0.06	0.18	1.6	0.88
121SB	7	0.17	NA	0.28	NA	0.04	0.02	0.68	0.69	0.22	0.15	0.21	0.92	3.4	2.71
121SB	8	0.02	NA	0.49	NA	0.00	0.00	0.02	0.01	0.03	0.00	0.06	0.02	0.7	0.05
121SB	9	0.20	NA	0.37	NA	0.01	0.00	0.15	0.14	0.32	0.04	0.05	0.12	1.4	0.81
121SB	10	0.29	NA	0.34	NA	0.00	0.00	0.11	0.09	0.15	0.05	0.05	0.08	1.2	0.64
121SB	11	0.26	NA	0.40	NA	0.01	0.00	0.11	0.10	0.22	0.05	0.06	0.23	1.4	0.78
121SB	13	0.02	NA	0.23	NA	0.00	0.00	0.03	0.02	0.02	0.01	0.03	0.06	0.4	0.06
121SB	14	0.02	NA	0.12	NA	0.01	0.00	0.18	0.18	0.02	0.04	0.09	0.18	0.8	0.43
121SB	15	0.01	NA	0.04	NA	0.00	0.00	0.09	0.07	0.07	0.01	0.03	0.05	0.4	0.21
121SB	16	3.55	NA	0.31	NA	0.01	0.00	0.16	0.15	0.06	0.06	0.06	0.08	4.4	3.93
121SB	17	0.02	NA	0.05	NA	0.00	0.00	0.00	0.00	0.02	0.00	0.03	0.01	0.1	0.03
Site Hazard		1.48	NA	0.56	NA	0.02	0.02	0.59	0.48	0.29	0.15	0.14	0.48	4.2	-
Adj. Site Hazard*		**1.48**	NA	**0.00**	NA	**0.02**	**0.01**	**0.57**	**0.47**	**0.29**	**0.13**	**0.00**	**0.34**	-	**3.30**

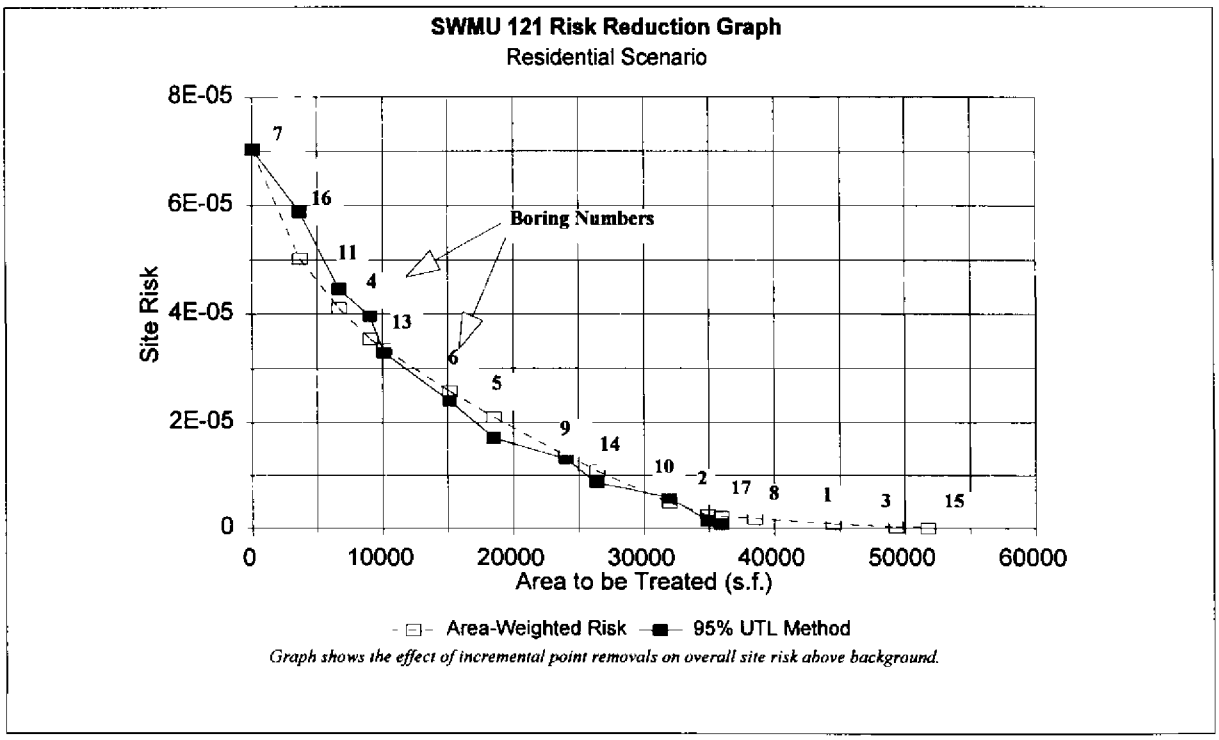
Industrial

Boring No.		Aroclor 1254	Aroclor 1260	As	BEQ	Be	Cu	Ni	Zn	Sb	Hg	Tl	V	Total Point Hazard	Hazard Above Background
121SB	1	0.00	NA	0.01	NA	0.00	0.00	0.00	0.00	0.01	0.00	0.02	0.00	0.0	0.00
"	2	0.05	NA	0.01	NA	0.00	0.00	0.01	0.01	0.01	0.01	0.00	0.04	0.1	0.05
"	3	0.00	NA	0.03	NA	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.1	0.00
"	4	0.00	NA	0.04	NA	0.00	0.00	0.01	0.01	0.00	0.00	0.00	0.01	0.1	0.00
"	5	0.00	NA	0.01	NA	0.00	0.00	0.00	0.00	0.01	0.00	0.01	0.00	0.0	0.00
"	6	0.01	NA	0.02	NA	0.00	0.00	0.01	0.01	0.01	0.00	0.00	0.01	0.1	0.01
"	7	0.01	NA	0.01	NA	0.00	0.00	0.03	0.03	0.01	0.01	0.01	0.05	0.2	0.05
"	8	0.00	NA	0.02	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.00
"	9	0.02	NA	0.02	NA	0.00	0.00	0.01	0.01	0.02	0.00	0.00	0.01	0.1	0.02
"	10	0.02	NA	0.02	NA	0.00	0.00	0.01	0.00	0.01	0.00	0.00	0.00	0.1	0.02
"	11	0.02	NA	0.02	NA	0.00	0.00	0.01	0.00	0.01	0.00	0.00	0.01	0.1	0.02
"	12	0.00	NA	0.01	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.00
"	13	0.00	NA	0.01	NA	0.00	0.00	0.01	0.01	0.00	0.00	0.00	0.01	0.0	0.00
"	14	0.00	NA	0.00	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.00
"	16	0.28	NA	0.02	NA	0.00	0.00	0.01	0.01	0.00	0.00	0.00	0.00	0.3	0.28
"	17	0.00	NA	0.00	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.00
Site Hazard		0.14	NA	0.03	NA	0.00	0.00	0.03	0.03	0.02	0.01	0.01	0.03	0.3	-
Adj. Site Hazard*		**0.14**	NA	**0.00**	NA	**0.00**	**0.00**	**0.03**	**0.03**	**0.02**	**0.01**	**0.01**	**0.03**	-	**0.25**

***Adj. Site Hazard = Total Site Hazard minus background hazard for Arsenic (Res: 0.71; Ind: 0.04), Beryllium (Res.: 0.0038; Ind.: app. 0), Copper (Res.: 0.0095; Ind. app. 0), Nickel (Res.: 0.023; Ind. app. 0), and Zinc (Res.: 0.0098; Ind. app. 0)**

Table A.3.5 SWMU 121 Residential Point Risk Reduction (1E-6)

Point to be Removed		Estimated Area (s.f.)	Cumul. Area	Individual Point Risks		Area Weighted Point Risks		Site Risk Remaining After Point Removal		
				Total	Above Bkgd.	Total	Above Bkgd.	Total	AW Method Above Bkgd	UCL Method Above Bkgd
SB121	7	3698	3698	133.9	100.8	20.4	20.2	101.1	50.2	58.8
"	16	3000	6698	91.6	56.3	11.3	9.1	89.7	41.1	44.7
"	11	2360	9057	84.4	43.7	8.2	5.6	81.5	35.5	39.6
"	4	1081	10139	90.7	33.4	4.0	2.0	77.5	33.6	32.9
"	13	5000	15139	53.7	28.4	11.1	7.7	66.4	25.9	24.1
"	6	3396	18535	67.8	26.6	9.5	4.9	56.9	21.0	17.2
"	5	5500	24035	51.0	24.1	11.6	7.2	45.3	13.9	13.2
"	9	2390	26425	61.5	22.9	6.1	3.0	39.2	10.9	8.6
"	14	5500	31925	44.5	20.3	10.1	6.0	29.2	4.9	5.8
"	10	3000	34925	51.4	14.4	6.4	2.3	22.8	2.5	1.5
"	2	1016	35941	28.4	4.4	1.2	0.2	21.6	2.3	0.8
"	3	2578	38519	52.7	3.7	5.6	0.5	16.0	1.8	-
"	15	6000	44519	22.0	2.7	5.4	0.9	10.5	0.9	-
"	17	4750	49269	13.2	2.2	2.6	0.6	8.0	0.3	-
"	8	2487	51756	43.2	1.7	4.4	0.2	3.5	0.1	-
"	1	4250	56006	20.1	0.4	3.5	0.1	-0.0	0.0	-



Graph shows the effect of incremental point removals on overall site risk above background.

Table A.3.6. SWMU 121 Point Risk Reduction (1E-6)
Industrial

Point to be Removed		Estimated Area (s.f.)	Cumul. Area	Individual Point Risks Total	Individual Point Risks Above Bkgd.	Area Weighted Point Risks Total	Area Weighted Point Risks Above Bkgd.	Site Risk Remaining After Point Removal Total	Site Risk Remaining After Point Removal AW Method Above Bkgd	Site Risk Remaining After Point Removal UCL Method Above Bkgd
SB121	7	3698	3698	13.2	9.7	3.4	4.8	15.9	6.9	10.4
"	16	3000	6698	8.3	3.8	1.8	1.5	14.1	5.4	7.6
"	4	1081	7779	9	2.2	0.7	0.3	13.4	5.0	6.8
"	11	2360	10139	7.4	2.2	1.2	0.7	12.2	4.4	5.6
"	6	3396	13535	6.6	2.1	1.6	1.0	10.6	3.4	4.3
"	14	5500	19035	4.3	1.6	1.7	1.2	8.9	2.2	3.3
"	13	5000	24035	4.6	1.3	1.6	0.9	7.3	1.3	2.6
"	9	2390	26425	5.8	1.2	1.0	0.4	6.3	1.0	1.7
"	5	5500	31925	4.4	1	1.7	0.7	4.6	0.2	1.1
"	10	3000	34925	4.7	0.3	1.0	0.1	3.6	0.1	0.3
"	2	1016	35941	2.6	0.3	0.2	0.0	3.4	0.1	0.2
"	17	4750	40691	1.1	0.1	0.4	0.1	3.1	-0.0	-
"	8	2487	43178	4.1	0	0.7	0.0	2.3	-0.0	-
"	1	4250	47428	1.9	0	0.6	0.0	1.8	-0.0	-
"	3	2578	50006	5.1	0	0.9	0.0	0.8	-0.0	-
"	15	6000	56006	2	0	0.8	0.0	0.0	-0.0	-

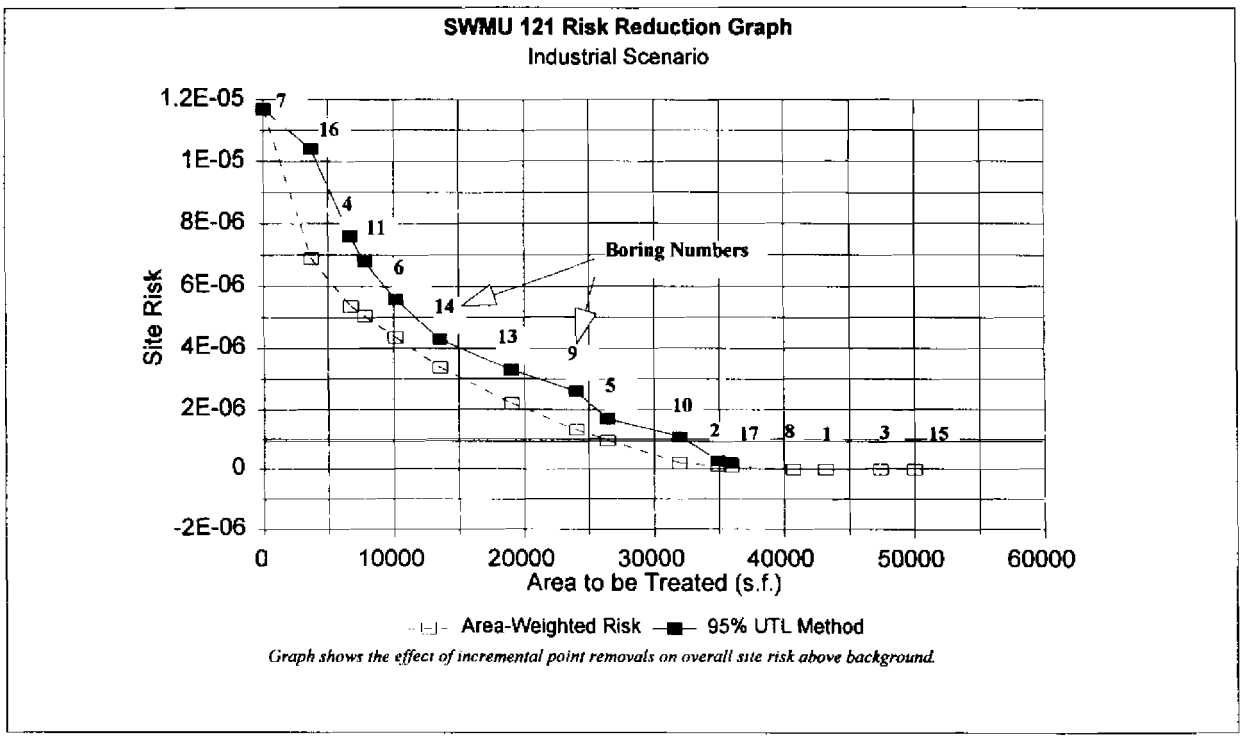
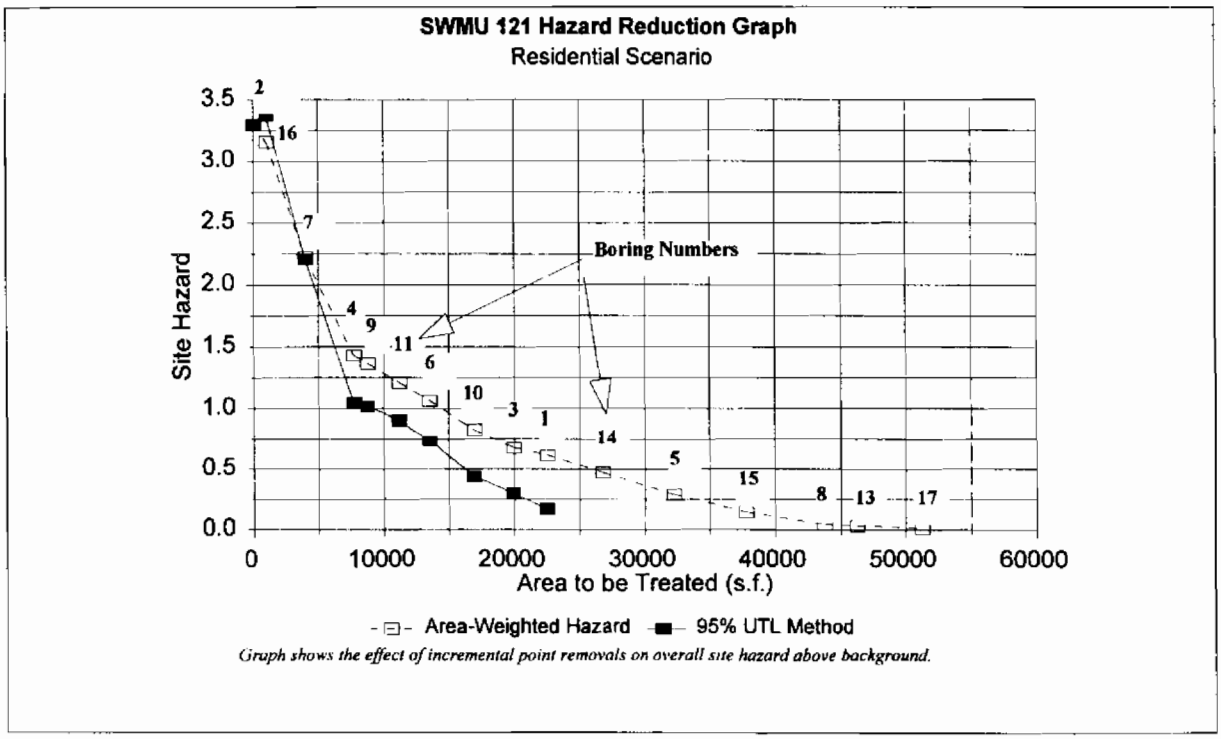


Table A.3.7. SWMU 121 Point Hazard Reduction
Residential

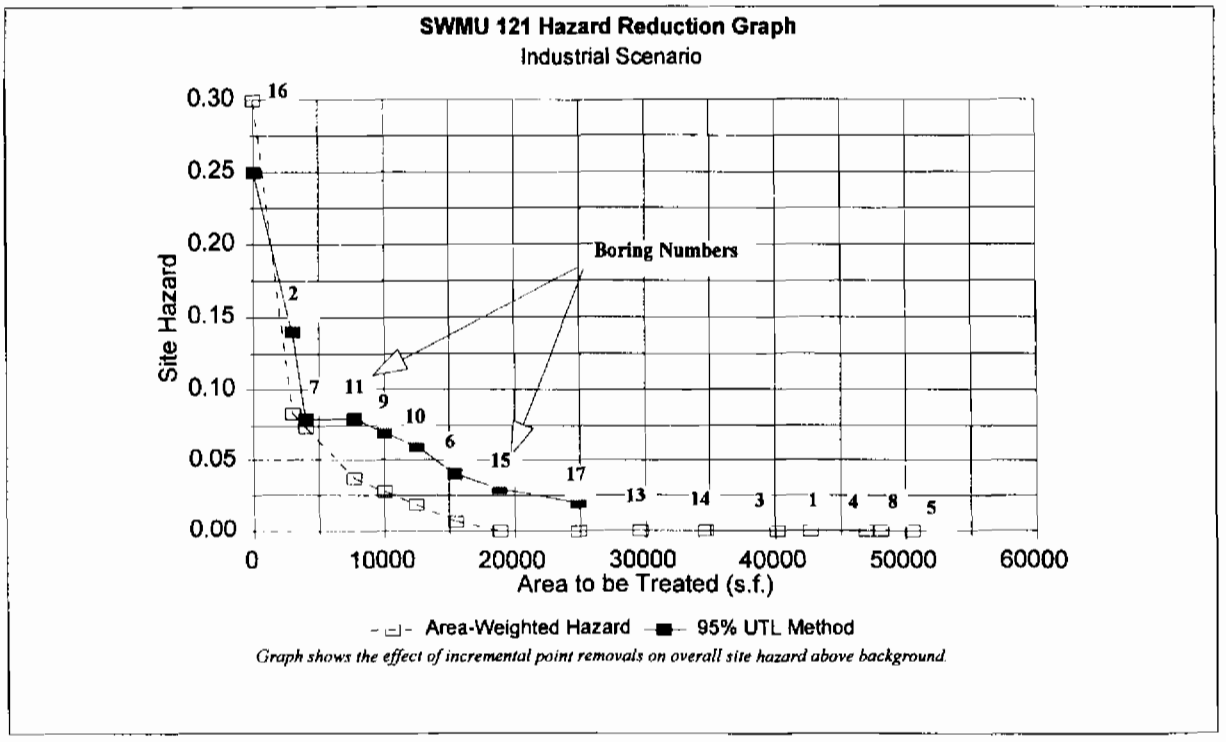
Point to be Removed		Estimated Area (s.f.)	Cumul. Area	Individual Point Hazard		Area Weighted Point Hazard		Site Hazard Remaining After Point Removal		
				Total	Above Bkgd.	Total	Above Bkgd.	Total	AW Method Above Bkgd	UCL Method Above Bkgd
SB121	2	1016	1016	2.3	1.73	0.1	0.14	4.1	3.2	3.37
"	16	3000	4016	4.4	3.93	0.8	0.94	3.2	2.2	2.21
"	7	3698	7714	3.4	2.71	0.8	0.80	2.4	1.4	1.05
"	4	1081	8795	1.7	0.73	0.1	0.06	2.3	1.4	1.02
"	9	2390	11185	1.4	0.81	0.2	0.15	2.1	1.2	0.91
"	11	2360	13544	1.4	0.78	0.2	0.15	1.9	1.1	0.74
"	6	3396	16941	1.6	0.88	0.3	0.24	1.6	0.8	0.44
"	10	3000	19941	1.2	0.64	0.2	0.15	1.3	0.7	0.3
"	3	2578	22519	1.0	0.29	0.2	0.06	1.2	0.6	0.17
"	1	4250	26769	0.8	0.42	0.2	0.14	1.0	0.5	-
"	14	5500	32269	0.8	0.43	0.3	0.19	0.7	0.3	-
"	5	5500	37769	0.8	0.33	0.3	0.14	0.4	0.1	-
"	15	6000	43769	0.4	0.21	0.2	0.10	0.3	0.0	-
"	8	2487	46256	0.7	0.05	0.1	0.01	0.2	0.0	-
"	13	5000	51256	0.4	0.06	0.1	0.02	0.0	0.0	-
"	17	4750	56006	0.1	0.03	0.0	0.01	-0.0	0.0	-



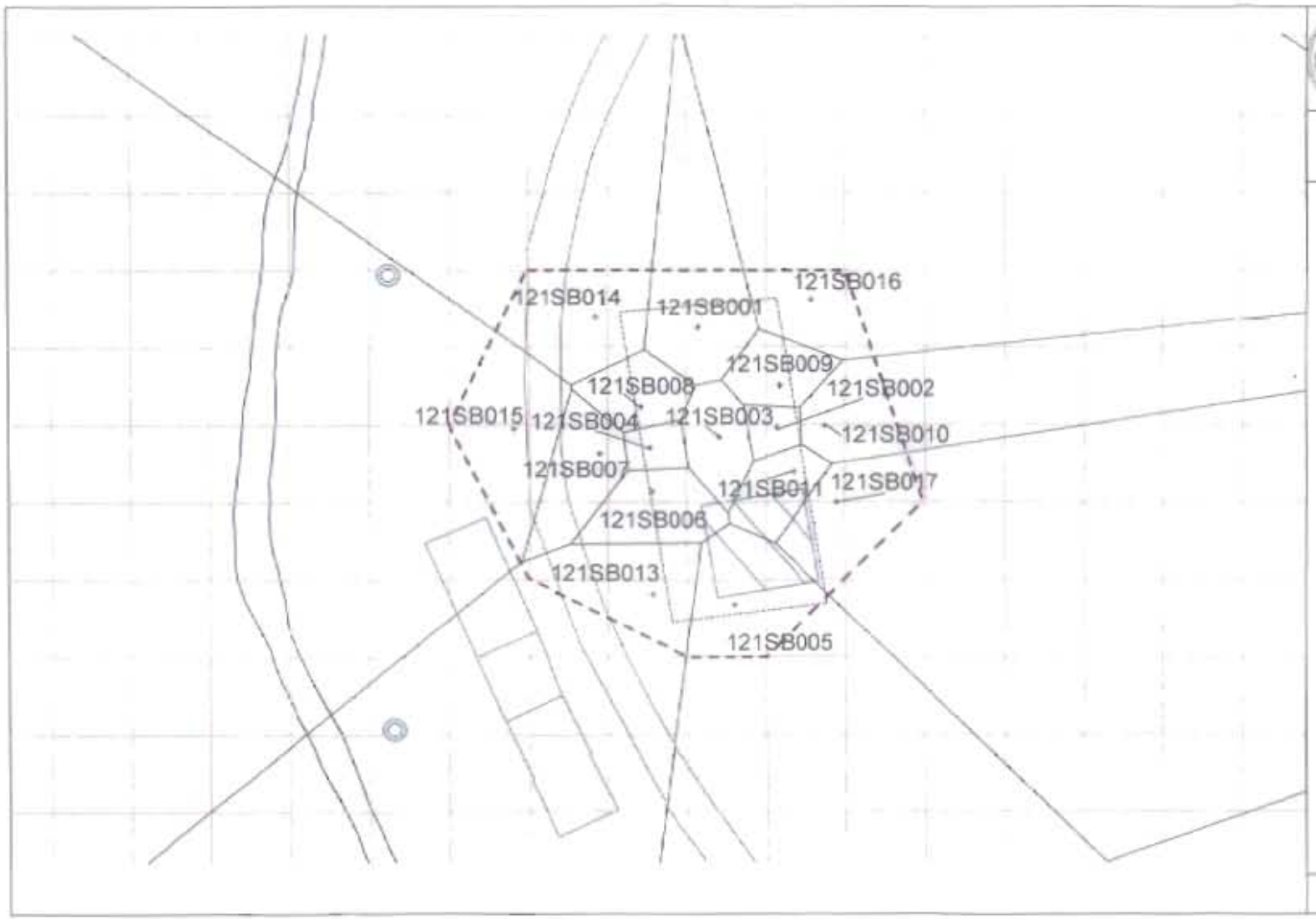
Graph shows the effect of incremental point removals on overall site hazard above background.

Table A.3.8. SWMU 121 Point Hazard Reduction
Industrial

Point to be Removed		Estimated Area (s.f.)	Cumul. Area	Individual Point Hazard Total	Individual Point Hazard Above Bkgd.	Area Weighted Point Hazard Total	Area Weighted Point Hazard Above Bkgd.	Site Hazard Remaining After Point Removal Total	Site Hazard Remaining After Point Removal AW Method Above Bkgd	Site Hazard Remaining After Point Removal UCL Method Above Bkgd
SB121	16	3000	3000	0.3	0.28	0.1	0.17	0.2	0.08	0.14
"	2	1016	4016	0.1	0.05	0.0	0.01	0.2	0.07	0.08
"	7	3698	7714	0.2	0.05	0.1	0.04	0.1	0.04	0.08
"	11	2360	10073	0.1	0.02	0.0	0.01	0.1	0.03	0.07
"	9	2390	12463	0.1	0.02	0.0	0.01	0.1	0.02	0.06
"	10	3000	15463	0.1	0.02	0.0	0.01	0.1	0.01	0.04
"	6	3396	18859	0.1	0.01	0.0	0.01	0.0	0.00	0.03
"	15	6000	24859	0.0	0.00	0.0	0.00	0.0	0.00	0.02
"	17	4750	29609	0.0	0.00	0.0	0.00	0.0	0.00	-
"	13	5000	34609	0.0	0.00	0.0	0.00	0.0	0.00	-
"	14	5500	40109	0.0	0.00	0.0	0.00	0.0	0.00	-
"	3	2578	42687	0.1	0.00	0.0	0.00	0.0	0.00	-
"	1	4250	46937	0.0	0.00	0.0	0.00	0.0	0.00	-
"	4	1081	48019	0.1	0.00	0.0	0.00	0.0	0.00	-
"	8	2487	50506	0.0	0.00	0.0	0.00	0.0	0.00	-
"	5	5500	56006	0.0	0.00	0.0	0.00	0.0	0.00	-



Graph shows the effect of incremental point removals on overall site hazard above background.



Charleston Naval Base
Zone H
Corrective Measures
Work Plan

Site 121
Risk -- Thiessen Polygons

Soil_pts.shp
Soil Sample Locations
Soil_the.shp
Risk -- Thiessen polygons
Grid_50.shp
50 -Foot Grid
Water
Pier
Road
Bldg
Fence

1:67

Table A.4.1 AOC 649/650 Surface Soil Concentration Summary

Boring No.		BEQ mg/kg
649SB	1	0.31
"	2	0.35
"	3	0.49
"	4	0.40
"	5	0.53
"	6	0.51
"	7	0.50
"	8	0.52
"	9	0.51
"	10	0.40
650SB	1	0.36
"	2	0.34
"	3	1.92
"	4	1.17
"	5	0.52
"	6	3.08
"	7	0.50
"	9	0.50
"	10	0.46

Note:

		Log Transformed Data					
	n	standard deviation	mean	H-value	95% UCL mg/kg	Max mg/kg	EPC mg/kg
B(a)P Eq. (BEQ)	19	0.594	-0.585	2.111	0.89	3.07515	0.89

Table A.4.2 AOC 649/ 650/ 651 Hazard Quotients and Incremental Lifetime Cancer Risks

Incidental Surface Soil Ingestion

Chemical	Oral RfD Used (mg/kg-day)	Oral SF Used (mg/kg-day)-1	Future Resident adult Hazard Quotient	Future Resident child Hazard Quotient	Future Resident Iwa ILCR	Site Worker adult Hazard Quotient	Site Worker adult ILCR
Benzo(a)pyrene equiv.	NA	7.3	ND	ND	1.0E-05	ND	1.1E-06
Total Incidental Ingestion Pathway Risk & Hazard:			ND	ND	1.0E-05	ND	1.1E-06

Dermal Contact With Surface Soil

Chemical		Oral RfD Used (mg/kg-day)	Oral SF Used (mg/kg-day)-1	Future Resident adult Hazard Quotient	Future Resident child Hazard Quotient	Future Resident Iwa ILCR	Site Worker adult Hazard Quotient	Site Worker adult ILCR
Benzo(a)pyrene equiv.	0.5	NA	14.6	ND	ND	4.6E-06	ND	1.9E-06
Total Dermal Pathway Risk & Hazard:				ND	ND	4.6E-06	ND	1.9E-06
Sum of All Soil Pathways:				ND	ND	1.5E-05	ND	3.0E-06

NOTES:

NA Not available

ND Not Determined due to lack of available information

ILCR Incremental Lifetime Cancer Risk

Dermal Adj. Dermal to absorbed dose adjustment factor is applied to adjust for Oral SF and RfD (i.e., the oral RfD is based on oral absorption efficiency which should not be applied to dermal exposure and dermal CDI)

Table A.4.3 AOC 649/650 Point Risk Summary (1E-6)

	Aroclor 1254	Aroclor 1260	As	BEQ	Be	Cu	Ni	Zn
SF (ing)	2	2	1.5	7.3	4.3	NA	NA	NA
SF (der)	4	4	7.5	14.6	21.5	NA	NA	NA
DAF	0.01	0.01	0.001	0.01	0.001	0.001	0.001	0.001

Residential

Boring No.		Aroclor 1254	Aroclor 1260	As	BEQ	Be	Cu	Ni	Zn	Total Point Risk	Risk Above Background*
649SB	1	-	-	-	5.2	-	-	-	-	5.2	0.0
"	2	-	-	-	5.7	-	-	-	-	5.7	0.0
"	3	-	-	-	8.0	-	-	-	-	8.0	1.3
"	4	-	-	-	6.7	-	-	-	-	6.7	0.0
"	5	-	-	-	8.8	-	-	-	-	8.8	2.1
"	6	-	-	-	8.4	-	-	-	-	8.4	1.7
"	7	-	-	-	8.2	-	-	-	-	8.2	1.5
"	8	-	-	-	8.6	-	-	-	-	8.6	1.9
"	9	-	-	-	8.4	-	-	-	-	8.4	1.7
"	10	-	-	-	6.6	-	-	-	-	6.6	0.0
650SB	1	-	-	-	6.0	-	-	-	-	6.0	0.0
"	2	-	-	-	5.6	-	-	-	-	5.6	0.0
"	3	-	-	-	31.8	-	-	-	-	31.8	25.1
"	4	-	-	-	19.4	-	-	-	-	19.4	12.7
"	5	-	-	-	8.6	-	-	-	-	8.6	1.9
"	6	-	-	-	50.9	-	-	-	-	50.9	44.2
"	7	-	-	-	8.2	-	-	-	-	8.2	1.5
"	9	-	-	-	8.2	-	-	-	-	8.2	1.5
"	10	-	-	-	7.7	-	-	-	-	7.7	1.0
Site Risk		-	-	-	14.8	-	-	-	-	14.8	-
Adj. Site Risk		**-**	**-**	**-**	**8.1**	**-**	**-**	**-**	**-**	**-**	**8.1**

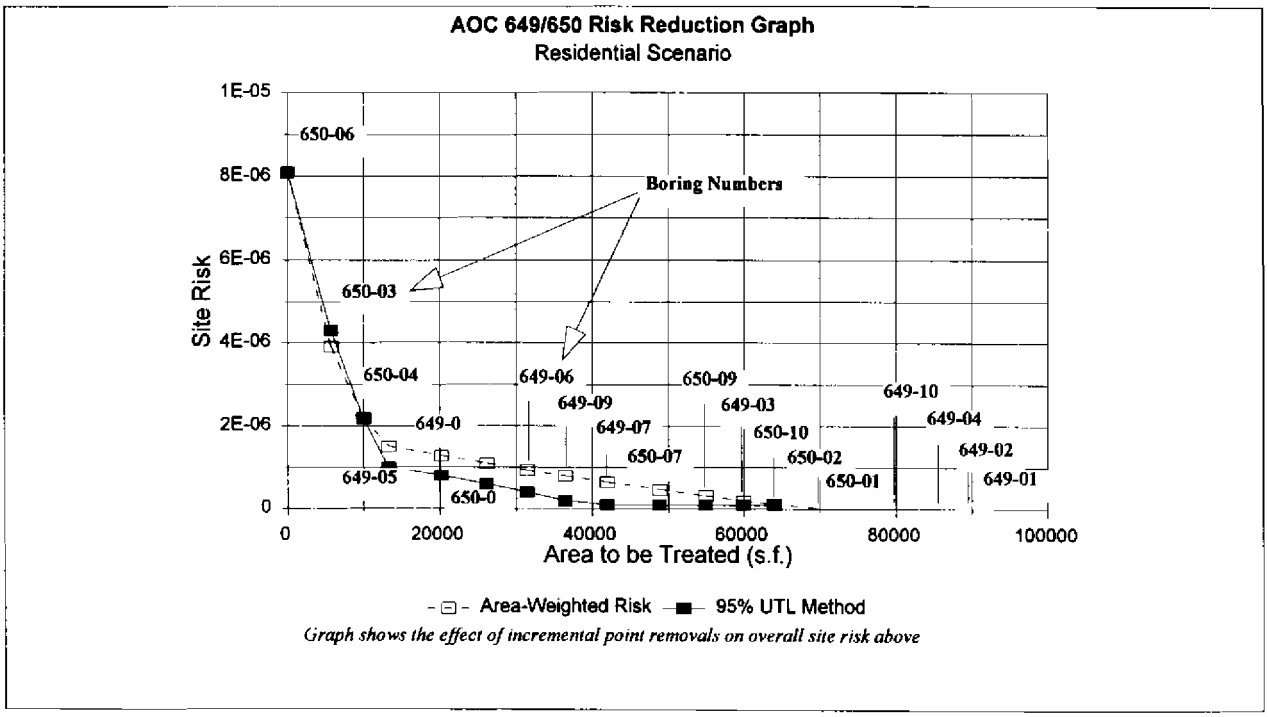
Industrial

Boring No.		Aroclor 1254	Aroclor 1260	As	BEQ	Be	Cu	Ni	Zn	Total Point Risk	Risk Above Background*
649SB	1	-	-	-	0.4	-	-	-	-	0.4	0.00
"	2	-	-	-	0.4	-	-	-	-	0.4	0.00
"	3	-	-	-	0.6	-	-	-	-	0.6	0.00
"	4	-	-	-	0.5	-	-	-	-	0.5	0.00
"	5	-	-	-	0.7	-	-	-	-	0.7	0.00
"	6	-	-	-	0.6	-	-	-	-	0.6	0.00
"	7	-	-	-	0.6	-	-	-	-	0.6	0.00
"	8	-	-	-	0.7	-	-	-	-	0.7	0.00
"	9	-	-	-	0.6	-	-	-	-	0.6	0.00
"	10	-	-	-	0.5	-	-	-	-	0.5	0.00
650SB	1	-	-	-	0.5	-	-	-	-	0.5	0.00
"	2	-	-	-	0.4	-	-	-	-	0.4	0.00
"	3	-	-	-	2.4	-	-	-	-	2.4	1.05
"	4	-	-	-	1.5	-	-	-	-	1.5	0.10
"	5	-	-	-	0.7	-	-	-	-	0.7	0.00
"	6	-	-	-	3.9	-	-	-	-	3.9	2.52
"	7	-	-	-	0.6	-	-	-	-	0.6	0.00
"	9	-	-	-	0.6	-	-	-	-	0.6	0.00
"	10	-	-	-	0.6	-	-	-	-	0.6	0.00
Site Risk		-	-	-	3.0	-	-	-	-	3.0	-
Adj. Site Risk		**-**	**-**	**-**	**1.6**	**-**	**-**	**-**	**-**	**-**	**1.6**

***Adj. Site Risk = Total Site Risk minus background risk for Arsenic (Res: 41E-6; Ind: 5.8E-6), Beryllium (Res.: 11E-6; Ind.: 1.5E-6), and BEQs (Res.: 6.7E-6; Ind.: 1.4E-6)**

Table A.4.4 AOC 649/650 Point Risk Reduction (1E-6)
Residential

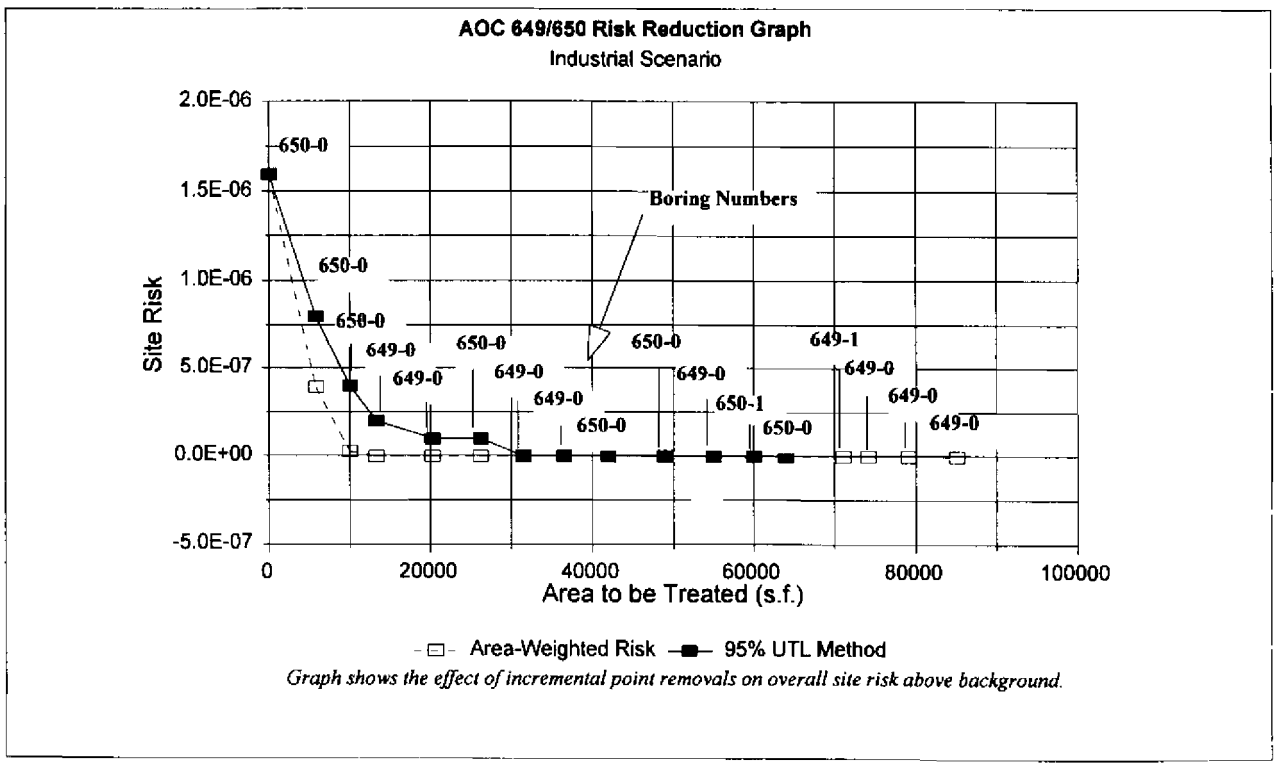
Point to be Removed		Estimated Area (s.f.)	Cumul. Area	Individual Point Risks		Area Weighted Point Risks		Site Risk Remaining After Point Removal		
				Total	Above Bckgrnd	Total	Above Bckgrnd	Total	AW Method Above Bkgd.	UCL Method Above Bkgd.
650SB	**6**	5799	5799	50.9	44.2	3.8	4.2	11.0	3.9	4.3
650SB	**3**	4216	10016	31.8	25.1	1.7	1.7	9.3	2.2	2.2
650SB	**4**	3253	13268	19.4	12.7	0.8	0.7	8.5	1.5	1
649SB	**5**	6915	20184	8.8	2.1	0.8	0.2	7.7	1.3	0.8
649SB	**8**	6000	26184	8.6	1.9	0.7	0.2	7.0	1.1	0.6
650SB	**5**	5244	31428	8.6	1.9	0.6	0.2	6.4	0.9	0.4
649SB	**6**	5000	36428	8.4	1.7	0.5	0.1	5.9	0.8	0.2
649SB	**9**	5500	41928	8.4	1.7	0.6	0.2	5.3	0.6	0.1
649SB	**7**	7000	48928	8.2	1.5	0.7	0.2	4.6	0.5	0.1
650SB	**7**	6000	54928	8.2	1.5	0.6	0.1	3.9	0.3	0.1
650SB	**9**	5000	59928	8.2	1.5	0.5	0.1	3.4	0.2	0.1
649SB	**3**	4081	64009	8.0	1.3	0.4	0.1	3.0	0.1	0.1
650SB	**10**	7000	71009	7.7	1	0.7	0.1	2.3	-0.0	0.1
650SB	**2**	3098	74107	5.6	0.0	0.2	0.0	2.0	-0.0	0
650SB	**1**	5000	79107	6.0	0.0	0.4	0.0	1.7	-0.0	0
649SB	**10**	6000	85107	6.6	0.0	0.5	0.0	1.2	-0.0	0
649SB	**4**	4798	89905	6.7	0.0	0.4	0.0	0.7	-0.0	0
649SB	**2**	5495	95400	5.7	0.0	0.4	0.0	0.3	-0.0	0
649SB	**1**	5006	100405	5.2	0.0	0.3	0.0	0.0	-0.0	0



Graph shows the effect of incremental point removals on overall site risk above

Table A.4.5 AOC 649/650 Point Risk Reduction (1E-6)
Industrial

Point to be Removed		Estimated Area (s.f.)	Cumul. Area	Individual Point Risks		Area Weighted Point Risks		Site Risk Remaining After Point Removal		
				Total	Above Bckgrnd	Total	Above Bckgrnd	Total	AW Method Above Bkgd.	UCL Method Above Bkgd.
650SB	6	5799	5799	3.9	2.52	0.8	1.2	2.2	0.4	0.8
650SB	3	4216	10016	2.4	1.05	0.4	0.4	1.8	0.0	0.4
650SB	4	3253	13268	1.5	0.10	0.2	0.0	1.6	-0.0	0.2
649SB	5	6915	20184	0.7	0.00	0.2	0.0	1.4	-0.0	0.1
649SB	8	6000	26184	0.7	0.00	0.2	0.0	1.3	-0.0	0.1
650SB	5	5244	31428	0.7	0.00	0.1	0.0	1.2	-0.0	0
649SB	6	5000	36428	0.6	0.00	0.1	0.0	1.1	-0.0	0
649SB	9	5500	41928	0.6	0.00	0.1	0.0	0.9	-0.0	0
649SB	7	7000	48928	0.6	0.00	0.2	0.0	0.8	-0.0	0
650SB	7	6000	54928	0.6	0.00	0.1	0.0	0.6	-0.0	0
650SB	9	5000	59928	0.6	0.00	0.1	0.0	0.5	-0.0	0
649SB	3	4081	64009	0.6	0.00	0.1	0.0	0.4	-0.0	0
650SB	10	7000	71009	0.6	0.00	0.2	0.0	0.3	-0.0	0
650SB	2	3098	74107	0.4	0.00	0.0	0.0	0.2	-0.0	0
650SB	1	5000	79107	0.4	0.00	0.1	0.0	0.2	-0.0	0
649SB	10	6000	85107	0.4	0.00	0.1	0.0	0.1	-0.0	0
649SB	4	4798	89905	0.5	0.00	0.1	0.0	0.0	-0.0	0
649SB	2	5495	95400	0.4	0.00	0.1	0.0	-0.1	-0.0	0
649SB	1	5006	100405	0.4	0.00	0.1	0.0	-0.2	-0.0	0



Graph shows the effect of incremental point removals on overall site risk above background.

Charleston Naval Base
Zone H
Corrective Measures
Work Plan

AOC 649 and 650
Thiessen Soil Risk Reduction Polygons

Soil_pts.shp
Soil Sample Locations
Soil_the.shp
Risk -- Thiessen polygons
Grid_50.shp
50 -Foot Grid
Water
Pier
Road
Bldg
Fence

N
W
E
S

1:70

Table A.5.1. SWMU 14 Surface Soil Concentration Summary

Boring No.		1254 mg/kg	1260 mg/kg	As mg/kg	BEQ mg/kg	Be mg/kg	Cu mg/kg	Ni mg/kg	Zn mg/kg	Sb mg/kg	Hg mg/kg	Tl mg/kg	V mg/kg
684SB	1	0.02	0.02	1.7	1.53	0.08	5.10	1.70	11.00	0.5	0.01	0.14	11.10
684SB	2	0.02	0.02	7	0.38	0.32	7.50	4.10	16.30	0.7	0.06	0.17	20.70
684SB	3	0.02	0.02	8.5	8.57	0.62	11.70	5.30	32.20	0.85	0.08	0.2	33.80
684SB	4	0.02	0.02	12.7	5.09	0.9	13.60	15.80	35.30	0.9	0.03	0.21	46.50
684SB	5	0.02	0.02	7.4	0.26	0.53	16.80	8.20	79.50	0.6	0.02	0.13	23.60
684SB	6	0.02	0.02	0.28	0.38	0.02	0.15	0.60	2.30	0.75	0.01	0.18	1.65
684SB	7	0.02	0.38	9	0.38	0.67	5.50	0.43	22.60	0.8	0.02	0.19	40.80
684SB	8	0.02	0.02	1.9	0.38	0.28	5.90	4.10	20.20	3	0.05	0.091	14.10
684SB	9	0.02	0.02	12.9	0.38	1.51	25.40	15.00	83.70	5.6	0.05	2.9	64.10
684SB	10	0.17	0.17	5.2	0.38	0.4	30.10	5.30	40.20	3	0.05	0.073	21.90
684SB	11	0.17	0.17	1.4	1.91	0.13	44.80	2.00	180.00	3	0.05	0.05	9.30
684SB	12	0.17	0.17	0.89	0.38	0.15	3.70	2.00	5.10	6.2	0.05	0.86	22.00
684SB	13	0.02	0.02	2.8	0.38	0.19	6.40	5.00	14.50	4.6	0.05	0.05	17.60
684SB	14	0.02	0.02	11.7	0.38	1.23	27.60	18.10	82.00	12.4	0.05	1.2	58.70
684SB	15	0.17	0.17	13.5	1.52	1.3	25.20	16.80	87.00	11.9	0.05	1.3	57.00
684SB	16	0.02	0.02	4.8	0.38	0.49	13.20	23.00	46.00	5.3	0.05	1.5	26.50
684SB	17	0.17	0.17	3.6	0.30	0.37	7.80	7.00	29.50	7.7	0.05	0.5	18.70
684SB	18	0.02	0.02	6.4	0.30	0.48	17.30	12.70	67.30	10.1	0.05	0.5	30.00
684SB	19	0.08	0.08	5.1	0.38	0.41	10.60	4.00	54.60	5.7	0.02	0.4	22.80
684SB	20	0.08	0.08	3.6	2.15	0.87	22.90	6.90	103.00	0.95	0.04	0.45	53.00
684SB	21	0.08	0.08	5.6	25.50	0.11	5.10	3.60	140.00	0.9	0.02	0.38	17.00
684SB	22	0.08	0.08	1.9	-	0.54	4.00	3.20	44.30	5.6	0.24	0.57	7.90
684SB	23	0.02	0.02	5.8	-	0.48	79.70	4.40	155.00	0.8	0.04	0.34	37.00
684SB	24	0.02	0.02	8.1	-	1.2	40.20	7.20	105.00	0.95	0.09	0.47	63.70
684SB	25	0.02	0.02	5.3	-	0.69	46.10	4.80	107.00	0.75	0.14	0.5	42.70
684SB	26	0.02	0.02	16.3	-	0.99	20.90	16.50	74.30	0.85	0.19	0.13	56.80
684SB	27	0.02	0.02	9.9	-	0.61	13.50	16.10	53.30	0.7	0.02	0.12	35.30
684SB	28	0.02	0.02	5.6	-	0.3	8.00	8.60	69.70	0.9	0.06	0.27	43.50
684SB	29	0.02	0.02	4.5	-	0.385	6.30	9.50	22.50	0.8	0.03	0.34	28.60
684SB	30	0.02	0.02	3.7	-	0.17	3.70	9.40	20.10	4.5	0.02	0.3	28.80
684SB	31	0.02	0.02	9.3	-	0.7	23.70	9.30	93.20	0.9	0.21	0.27	72.00
684SB	32	-	-	-	0.35	-	-	-	-	-	-	-	-
684SB	33	-	-	-	0.42	-	-	-	-	-	-	-	-
684SB	34	-	-	-	0.36	-	-	-	-	-	-	-	-
684SB	35	-	-	-	28.07	-	-	-	-	-	-	-	-
684SB	36	0.02	0.02	11.7	1.63	0.7	15.30	13.50	69.50	3.4	0.12	0.21	40.00
684SB	37	-	-	-	0.38	-	-	-	-	-	-	-	-
684SB	38	-	-	-	0.38	-	-	-	-	-	-	-	-
684SB	39	-	-	-	0.38	-	-	-	-	-	-	-	-
684SB	40	-	-	-	0.70	-	-	-	-	-	-	-	-
684SB	41	-	-	-	0.50	-	-	-	-	-	-	-	-
684SB	42	-	-	-	0.47	-	-	-	-	-	-	-	-
684SB	43	-	-	-	4.27	-	-	-	-	-	-	-	-
684SB	44	-	-	-	10.32	-	-	-	-	-	-	-	-

Table A.5.1. SWMU 14 Surface Soil Concentration Summary

Boring No.		1254 mg/kg	1260 mg/kg	As mg/kg	BEQ mg/kg	Ba mg/kg	Cu mg/kg	Ni mg/kg	Zn mg/kg	Sb mg/kg	Hg mg/kg	Tl mg/kg	V mg/kg
014SB	1	0.02	0.02	7.00	0.38	0.42	8.50	8.00	77.00	0.75	0.20	0.19	50.10
014SB	2	0.02	0.02	8.00	0.38	0.55	11.00	11.00	91.10	0.80	0.18	0.25	65.10
014SB	3	0.02	0.02	6.00	0.38	0.44	8.00	16.00	52.00	4.70	0.07	0.21	68.60
014SB	4	0.02	0.02	11.90	0.38	0.88	20.60	20.30	92.90	2.00	0.11	0.17	62.20
014SB	5	0.02	0.02	9.60	0.37	0.50	22.60	10.40	95.20	1.70	0.12	0.26	65.70
014SB	6	0.02	0.02	8.40	0.38	1.00	21.80	11.60	87.70	0.90	0.08	0.47	68.80
014SB	7	0.02	0.02	6.60	0.26	1.00	20.70	12.00	87.30	0.65	0.07	0.45	62.50
014SB	8	0.02	0.02	8.10	0.38	0.82	42.40	10.30	79.40	0.55	0.05	0.50	40.40
014SB	9	0.02	0.02	6.80	0.38	1.00	21.10	11.70	92.40	0.65	0.11	0.34	63.10
014SB	10	-	-	9.65	-	1.20	24.70	18.80	87.30	4.25	0.16	0.35	71.90
014SB	11	-	-	5.35	-	0.82	7.05	23.30	80.30	5.65	0.95	0.55	49.30
014SB	106	0.03	0.03	13.60	1.20	1.10	26.90	26.70	103.00	4.65	0.09	0.29	67.90
015SB	1	0.02	0.02	6.40	0.24	0.19	7.10	4.90	51.50	2.75	0.03	0.90	11.90
015SB	2	0.02	0.02	3.60	0.40	0.30	7.80	10.50	60.00	0.95	0.02	0.95	19.20
015SB	3	0.03	0.03	15.00	0.62	0.63	13.90	8.30	67.50	0.90	0.16	1.50	34.10
015SB	4	0.01	0.01	53.10	2.17	0.88	57.70	17.40	173.00	0.70	0.13	0.21	56.30
015SB	5	-	-	-	0.51	-	-	-	-	-	-	-	-
015SB	6	-	-	-	0.62	-	-	-	-	-	-	-	-
015SB	7	-	-	-	0.38	-	-	-	-	-	-	-	-
015SB	8	-	-	-	0.43	-	-	-	-	-	-	-	-
670SB	1	0.03	0.03	15.60	0.58	0.77	15.60	23.20	78.10	0.70	0.09	1.15	50.40
670SB	2	0.03	0.03	9.70	0.56	0.60	15.20	21.00	66.00	0.80	0.06	1.35	42.60
670SB	3	0.02	0.02	-	7.76	-	-	-	-	-	-	-	-
670SB	4	0.03	0.03	11.30	1.05	0.64	12.10	22.80	50.50	3.70	0.10	0.23	36.10
670SB	5	0.03	0.03	15.20	1.59	0.94	20.00	21.50	87.90	0.80	0.07	0.23	61.90
670SB	6	0.03	0.03	13.6	0.59	0.87	19.6	22.4	86.6	0.8	0.09	0.03	58.1
670SB	7	0.01	0.01	8.90	0.52	0.47	9.70	16.10	43.00	3.90	0.03	0.48	27.00
670SB	8	0.03	0.03	9.70	0.98	0.62	14.60	23.60	75.70	3.85	0.11	0.24	75.70
670SB	9	0.03	0.03	9.10	0.55	0.64	10.80	24.70	56.50	9.50	0.04	0.03	31.20
670SB	10	0.03	0.03	10.40	0.54	0.93	14.90	29.00	74.30	4.30	0.05	0.82	48.10
670SB	11	0.03	0.03	8.90	0.55	0.32	7.90	12.40	29.50	3.00	0.02	1.00	19.50
670SB	12	0.03	0.03	23.70	0.70	0.58	15.20	18.20	61.40	11.40	0.06	0.07	38.90
670SB	13	0.02	0.02	4.65	0.36	0.22	-	-	-	8.15	-	0.95	20.70
670SB	14	0.01	0.01	9.50	0.58	0.75	15.50	19.00	87.60	8.60	0.06	0.03	48.70
670SB	15	0.02	0.02	10.90	0.28	0.28	-	-	-	3.30	-	0.80	17.65
670SB	16	0.03	0.03	12.10	0.51	0.88	19.10	19.00	78.80	0.10	0.14	0.28	51.90
670SB	17	0.03	0.03	6.20	0.58	0.55	11.20	21.40	61.90	6.30	0.04	0.28	26.80
670SB	18	0.03	0.03	10.10	0.57	0.59	13.20	19.40	29.10	0.80	0.08	0.25	35.60
670SB	19	0.02	0.02	7.00	0.26	0.85	-	-	-	6.90	-	1.15	42.60
670SB	20	0.02	0.02	8.40	0.38	0.39	-	-	-	4.75	-	1.10	24.40
670SB	21	0.02	0.02	7.90	0.53	0.48	11.30	17.60	21.60	0.95	0.06	0.24	69.60
670SB	22	0.02	0.02	9.30	0.54	0.51	13.00	16.90	29.30	0.95	0.06	0.23	69.60
670SB	23	0.03	0.03	69.00	0.58	0.70	16.90	16.70	31.15	0.95	0.07	0.70	69.60
670SB	24	0.03	0.03	13.00	0.57	-	-	-	-	-	-	-	-
670SB	25	0.02	0.02	6.85	-	0.46	-	-	-	0.80	-	0.29	56.10
670SB	26	0.02	0.02	12.30	0.38	0.87	-	-	-	6.00	-	0.11	56 10
670SB	27	0.02	0.02	8.30	0.38	0.61	-	-	-	5.45	-	0.10	30.90
670SB	28	-	-	-	0.55	-	-	-	-	-	-	-	-
670SB	29	-	-	-	7.53	-	-	-	-	-	-	-	-
670SB	30	-	-	-	0.43	-	-	-	-	-	-	-	-
670SB	31	0.02	0.02	15.40	51.73	1.10	-	-	-	0.80	-	0.25	34.15
670SB	32	0.02	0.02	17.2	1.05	1.2	-	-	-	0.65	-	0.75	67.4
670SB	33	-	-	-	0.45	-	-	-	-	-	-	-	-
670SB	34	-	-	-	2.14	-	-	-	-	-	-	-	-
670SB	35	-	-	-	0.40	-	-	-	-	-	-	-	-

Table A.5.1. SWMU 14 Surface Soil Concentration Summary

		Log Transformed Data					
	n	standard deviation	mean	H-value	95% UCL mg/kg	Max mg/kg	EPC mg/kg
Aroclor 1254	75	0.624	-3.674	1.965	0.036	********	0.04
Aroclor 1260	75	0.697	-3.635	2.023	0.040	********	0.04
Arsenic	76	0.787	2.020	2.101	12.43	69.00	12.43
B(a)P Eq.	86	1.114	-0.332	2.431	1.79	51.73	1.79
Beryllium	75	0.720	-0.645	2.042	0.81	1.51	0.81
Copper	66	0.866	2.576	2.174	24.16	79.70	24.16
Nickel	66	0.879	2.293	2.186	18.50	29.00	18.50
Zinc	66	0.780	3.982	2.094	88.99	180.00	88.99
Antimony	66	1.050	0.645	2.361	4.50	12.40	4.50
Mercury	66	0.806	-2.801	2.118	0.10	0.95	0.10
Thallium	66	0.987	-1.172	2.293	0.65	2.90	0.65
Vanadium	66	0.653	3.577	1.988	51.41	75.70	51.41

Table A.5.2 SWMU 14 Hazard Quotients and Incremental Lifetime Cancer Risks

Incidental Surface Soil Ingestion

Chemical	Oral RfD Used (mg/kg-day)	Oral SF Used (mg/kg-day)-1	Future Resident adult Hazard Quotient	Future Resident child Hazard Quotient	Future Resident Iwa ILCR	Site Worker adult Hazard Quotient	Site Worker adult ILCR
Aroclor 1254	2E-05	2	0.0024	0.023	1.1E-07	0.0009	1.2E-08
Aroclor 1260	NA	2	ND	ND	1.2E-07	ND	1.4E-08
Arsenic	0.0003	1.5	0.057	0.53	2.9E-05	0.020	3.3E-06
Benzo(a)pyrene equiv.	NA	7.3	ND	ND	2.0E-05	ND	2.3E-06
Beryllium	0.005	4.3	0.00022	0.0021	5.4E-06	0.00008	6.1E-07
Copper	3.5	NA	0.0000	0.000	ND	0.00000	ND
Nickel	0.02	NA	0.001	0.01	ND	0.0005	ND
Zinc	0.3	NA	0.000	0.00	ND	0.0001	ND
Antimony	0.0004	NA	0.015	0.14	ND	0.0055	ND
Mercury	0.0003	NA	0.000	0.00	ND	0.0002	ND
Thallium	8E-05	NA	0.011	0.10	ND	0.0040	ND
Vanadium	0.007	NA	0.010	0.09	ND	0.0036	ND
Total Incidental Ingestion Pathway Risk & Hazard:			0.10	0.92	6E-05	0.04	6E-06

Dermal Contact With Surface Soil

Chemical	Dermal Adjustment	Oral RfD Used (mg/kg-day)	Oral SF Used (mg/kg-day)-1	Future Resident adult Hazard Quotient	Future Resident child Hazard Quotient	Future Resident Iwa ILCR	Site Worker adult Hazard Quotient	Site Worker adult ILCR
Aroclor 1254	0.5	1E-05	4	0.0020	0.007	5.0E-08	0.0014	2.0E-08
Aroclor 1260	0.5	NA	4	ND	ND	5.6E-08	ND	2.3E-08
Arsenic	0.2	6E-05	7.5	0.012	0.038	3.3E-06	0.008	1.3E-06
Benzo(a)pyrene equiv.	0.5	NA	14.6	ND	ND	9.2E-06	ND	3.7E-06
Beryllium	0.2	0.001	21.5	0.000045	0.00015	6.1E-07	0.000032	2.5E-07
Copper	0.2	0.7	NA	0.00000	0.00001	ND	0.00000	ND
Nickel	0.2	0.004	NA	0.0003	0.001	ND	0.0002	ND
Zinc	0.2	0.06	NA	0.0001	0.0003	ND	0.0001	ND
Antimony	0.2	8E-05	NA	0.0032	0.0104	ND	0.0023	ND
Mercury	0.2	6E-05	NA	0.0001	0.0003	ND	0.0001	ND
Thallium	0.2	1.6E-05	NA	0.0023	0.0076	ND	0.0016	ND
Vanadium	0.2	0.0014	NA	0.0021	0.0068	ND	0.0015	ND
Total Dermal Pathway Risk & Hazard:				0.02	0.07	1E-05	0.02	5E-06
Sum of All Soil Pathways:				0.12	0.99	6.8E-05	0.05	1.2E-05

NOTES:

NA Not available

ND Not Determined due to lack of available information

ILCR Incremental Lifetime Cancer Risk

Dermal Adj. Dermal to absorbed dose adjustment factor is applied to adjust for Oral SF and RfD (i.e., the oral RfD is based on oral absorption efficiency which should not be applied to dermal exposure and dermal CDI)

Table A.5.3. Combined SWMU 14 Point Risk (1E-6)

	Aroclor 1254	Aroclor 1260	As	BEQ	Be	Cu	Ni	Zn	Sb	Hg	Tl	V
SF (ing)	2	2	1.5	7.3	4.3	NA	NA	NA	NA	NA	NA	NA
SF (der)	4	4	7.5	14.6	21.5	NA	NA	NA	NA	NA	NA	NA
DAF	0.01	0.01	0.001	0.01	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001

Residential

Boring No.		Aroclor 1254	Aroclor 1260	As	BEQ	Be	Cu	Ni	Zn	Sb	Hg	Tl	V	Total Point Risk	Total Adj.* Point Risk
014SB	1	0.1	0.1	18.3	6.3	3.1	-	-	-	-	-	-	-	27.9	0.2
014SB	2	0.1	0.1	20.9	6.3	4.1	-	-	-	-	-	-	-	31.5	0.2
014SB	3	0.1	0.1	15.7	6.3	3.3	-	-	-	-	-	-	-	25.5	0.2
014SB	4	0.1	0.1	31.1	6.3	6.6	-	-	-	-	-	-	-	44.2	0.2
014SB	5	0.1	0.1	25.1	6.1	3.7	-	-	-	-	-	-	-	35.1	0.2
014SB	6	0.1	0.1	21.9	6.3	7.5	-	-	-	-	-	-	-	35.9	0.2
014SB	7	0.1	0.1	17.2	4.3	7.5	-	-	-	-	-	-	-	29.2	0.2
014SB	8	0.1	0.1	21.2	6.3	6.1	-	-	-	-	-	-	-	33.8	0.2
014SB	9	0.1	0.1	17.2	6.3	7.5	-	-	-	-	-	-	-	31.2	0.2
014SB	10	0.0	0.0	25.2	0.0	9.0	-	-	-	-	-	-	-	34.2	0.0
014SB	11	0.0	0.0	14.0	0.0	6.1	-	-	-	-	-	-	-	20.1	0.0
014SB	106	0.1	0.1	35.5	19.9	8.2	-	-	-	-	-	-	-	63.9	13.4
015SB	1	0.1	0.1	16.7	3.9	1.4	-	-	-	-	-	-	-	22.2	0.2
015SB	2	0.1	0.1	9.4	6.7	2.2	-	-	-	-	-	-	-	18.5	0.1
015SB	3	0.1	0.1	39.2	10.3	4.7	-	-	-	-	-	-	-	54.4	3.8
015SB	4	0.0	0.0	138.7	36.0	6.6	-	-	-	-	-	-	-	181.4	127.1
015SB	5	0.0	0.0	0.0	8.4	0.0	-	-	-	-	-	-	-	8.4	1.7
015SB	6	0.0	0.0	0.0	10.3	0.0	-	-	-	-	-	-	-	10.3	3.6
015SB	7	0.0	0.0	0.0	6.2	0.0	-	-	-	-	-	-	-	6.2	0.0
015SB	8	0.0	0.0	0.0	7.1	0.0	-	-	-	-	-	-	-	7.1	0.4
670SB	1	0.1	0.1	40.7	9.6	5.8	-	-	-	-	-	-	-	56.3	3.1
670SB	2	0.1	0.1	25.3	9.3	4.5	-	-	-	-	-	-	-	39.3	2.8
670SB	3	0.1	0.1	0.0	128.5	0.0	-	-	-	-	-	-	-	128.7	122.0
670SB	4	0.1	0.1	29.5	17.3	4.8	-	-	-	-	-	-	-	51.9	10.9
670SB	5	0.1	0.1	39.7	26.3	7.0	-	-	-	-	-	-	-	73.3	19.9
670SB	6	0.1	0.1	36.0	9.8	6.5	-	-	-	-	-	-	-	52.6	3.3
670SB	7	0.0	0.0	23.2	8.6	3.5	-	-	-	-	-	-	-	35.5	2.0
670SB	8	0.1	0.1	25.3	16.3	4.6	-	-	-	-	-	-	-	46.5	9.8
670SB	9	0.1	0.1	23.8	9.2	4.8	-	-	-	-	-	-	-	38.0	2.7
670SB	10	0.1	0.1	27.2	9.0	7.0	-	-	-	-	-	-	-	43.3	2.5
670SB	11	0.1	0.1	23.2	9.2	2.4	-	-	-	-	-	-	-	35.1	2.7
670SB	12	0.1	0.1	61.9	11.7	4.3	-	-	-	-	-	-	-	78.1	26.1
670SB	13	0.1	0.1	12.1	5.9	1.6	-	-	-	-	-	-	-	19.9	0.2
670SB	14	0.0	0.0	24.8	9.6	5.6	-	-	-	-	-	-	-	40.1	3.0
670SB	15	0.1	0.1	28.5	4.7	2.1	-	-	-	-	-	-	-	35.4	0.2
670SB	16	0.1	0.1	31.6	8.4	6.6	-	-	-	-	-	-	-	46.8	1.9
670SB	17	0.1	0.1	21.4	9.6	4.1	-	-	-	-	-	-	-	35.3	3.1
670SB	18	0.1	0.1	26.4	9.4	4.4	-	-	-	-	-	-	-	40.4	2.9
670SB	19	0.1	0.1	18.3	4.3	6.4	-	-	-	-	-	-	-	29.2	0.2
670SB	20	0.1	0.1	21.9	6.3	2.9	-	-	-	-	-	-	-	31.4	0.2
670SB	21	0.1	0.1	20.6	8.8	3.6	-	-	-	-	-	-	-	33.2	2.3
670SB	22	0.1	0.1	24.3	9.0	3.8	-	-	-	-	-	-	-	37.3	2.5
670SB	23	0.1	0.1	180.2	9.6	5.2	-	-	-	-	-	-	-	195.3	142.3
670SB	24	0.1	0.1	34.0	9.4	0.0	-	-	-	-	-	-	-	43.6	2.9
670SB	25	0.1	0.1	17.9	0.0	3.4	-	-	-	-	-	-	-	21.5	0.2
670SB	26	0.1	0.1	32.1	6.3	6.5	-	-	-	-	-	-	-	45.1	0.2
670SB	27	0.1	0.1	21.7	6.3	4.6	-	-	-	-	-	-	-	32.7	0.2
670SB	28	0.0	0.0	0.0	9.2	0.0	-	-	-	-	-	-	-	9.2	2.5
670SB	29	0.0	0.0	0.0	124.6	0.0	-	-	-	-	-	-	-	124.6	117.9
670SB	30	0.0	0.0	0.0	7.2	0.0	-	-	-	-	-	-	-	7.2	0.5

Residential

Boring No.		Aroclor 1254	Aroclor 1260	As	BEQ	Be	Cu	Ni	Zn	Sb	Hg	Tl	V	Total Point Risk	Total Adj.* Point Risk
670SB	31	0.1	0.1	40.2	856.8	8.2	-	-	-	-	-	-	-	905.4	850.2
670SB	32	0.1	0.1	44.9	17.4	9.0	-	-	-	-	-	-	-	71.5	14.8
670SB	33	0.0	0.0	0.0	7.5	0.0	-	-	-	-	-	-	-	7.5	0.8
670SB	34	0.0	0.0	0.0	35.4	0.0	-	-	-	-	-	-	-	35.4	28.7
670SB	35	0.0	0.0	0.0	6.7	0.0	-	-	-	-	-	-	-	6.7	0.0
684SB	1	0.1	0.1	4.4	25.3	0.6	-	-	-	-	-	-	-	30.5	18.7
684SB	2	0.1	0.1	18.3	6.3	2.4	-	-	-	-	-	-	-	27.2	0.2
684SB	3	0.1	0.1	22.2	141.9	4.6	-	-	-	-	-	-	-	168.9	135.4
684SB	4	0.1	0.1	33.2	84.2	6.7	-	-	-	-	-	-	-	124.3	77.7
684SB	5	0.1	0.1	19.3	4.2	4.0	-	-	-	-	-	-	-	27.7	0.2
684SB	6	0.1	0.1	0.7	6.3	0.1	-	-	-	-	-	-	-	7.4	0.2
684SB	7	0.1	1.7	23.5	6.3	5.0	-	-	-	-	-	-	-	36.7	1.8
684SB	8	0.1	0.1	5.0	6.3	2.1	-	-	-	-	-	-	-	13.6	0.2
684SB	9	0.1	0.1	33.7	6.3	11.3	-	-	-	-	-	-	-	51.5	0.5
684SB	10	0.8	0.8	13.6	6.3	3.0	-	-	-	-	-	-	-	24.4	1.5
684SB	11	0.8	0.8	3.7	31.6	1.0	-	-	-	-	-	-	-	37.7	26.4
684SB	12	0.8	0.8	2.3	6.3	1.1	-	-	-	-	-	-	-	11.3	1.5
684SB	13	0.1	0.1	7.3	6.3	1.4	-	-	-	-	-	-	-	15.2	0.2
684SB	14	0.1	0.1	30.6	6.3	9.2	-	-	-	-	-	-	-	46.3	0.2
684SB	15	0.8	0.8	35.3	25.1	9.7	-	-	-	-	-	-	-	71.6	19.9
684SB	16	0.1	0.1	12.5	6.3	3.7	-	-	-	-	-	-	-	22.7	0.2
684SB	17	0.8	0.8	9.4	5.0	2.8	-	-	-	-	-	-	-	18.7	1.5
684SB	18	0.1	0.1	16.7	5.0	3.6	-	-	-	-	-	-	-	25.5	0.2
684SB	19	0.4	0.4	13.3	6.2	3.1	-	-	-	-	-	-	-	23.3	0.7
684SB	20	0.4	0.4	9.4	35.7	6.5	-	-	-	-	-	-	-	52.3	29.7
684SB	21	0.4	0.4	14.6	422.3	0.8	-	-	-	-	-	-	-	438.5	416.3
684SB	22	0.4	0.4	5.0	0.0	4.0	-	-	-	-	-	-	-	9.7	0.7
684SB	23	0.1	0.1	15.1	0.0	3.6	-	-	-	-	-	-	-	18.9	0.2
684SB	24	0.1	0.1	21.2	0.0	9.0	-	-	-	-	-	-	-	30.3	0.2
684SB	25	0.1	0.1	13.8	0.0	5.2	-	-	-	-	-	-	-	19.2	0.2
684SB	26	0.1	0.1	42.6	0.0	7.4	-	-	-	-	-	-	-	50.2	1.8
684SB	27	0.1	0.1	25.9	0.0	4.6	-	-	-	-	-	-	-	30.6	0.2
684SB	28	0.1	0.1	14.6	0.0	2.2	-	-	-	-	-	-	-	17.1	0.2
684SB	29	0.1	0.1	11.8	0.0	2.9	-	-	-	-	-	-	-	14.8	0.2
684SB	30	0.1	0.1	9.7	0.0	1.3	-	-	-	-	-	-	-	11.1	0.2
684SB	31	0.1	0.1	24.3	0.0	5.2	-	-	-	-	-	-	-	29.7	0.2
684SB	32	0.0	0.0	0.0	5.8	0.0	-	-	-	-	-	-	-	5.8	0.0
684SB	33	0.0	0.0	0.0	7.0	0.0	-	-	-	-	-	-	-	7.0	0.3
684SB	34	0.0	0.0	0.0	6.0	0.0	-	-	-	-	-	-	-	6.0	0.0
684SB	35	0.0	0.0	0.0	464.9	0.0	-	-	-	-	-	-	-	464.9	458.2
684SB	36	0.1	0.1	30.6	26.9	5.2	-	-	-	-	-	-	-	62.9	20.4
684SB	37	0.0	0.0	0.0	6.3	0.0	-	-	-	-	-	-	-	6.3	0.0
684SB	38	0.0	0.0	0.0	6.3	0.0	-	-	-	-	-	-	-	6.3	0.0
684SB	39	0.0	0.0	0.0	6.3	0.0	-	-	-	-	-	-	-	6.3	0.0
684SB	40	0.0	0.0	0.0	11.5	0.0	-	-	-	-	-	-	-	11.5	4.8
684SB	41	0.0	0.0	0.0	8.2	0.0	-	-	-	-	-	-	-	8.2	1.5
684SB	42	0.0	0.0	0.0	7.8	0.0	-	-	-	-	-	-	-	7.8	1.1
684SB	43	0.0	0.0	0.0	70.7	0.0	-	-	-	-	-	-	-	70.7	64.0
684SB	44	0.0	0.0	0.0	170.9	0.0	-	-	-	-	-	-	-	170.9	164.2
Site Risk		0.2	0.2	32.5	29.6	6.0	-	-	-	-	-	-	-	68.5	-
Adj. Site Risk*		**0.2**	**0.2**	**0.0**	**22.9**	**0.0**	-	-	-	-	-	-	-	-	**23.3**

SWMU 14 Point Risk (1E-6)
Industrial

Boring No.		Aroclor 1254	Aroclor 1260	As	BEQ	Be	Cu	Ni	Zn	Sb	Hg	Tl	V	Total Point Risk	Total Adj.* Point Risk
014SB	1	0.0	0.0	1.8	0.5	0.3	-	-	-	-	-	-	-	2.7	0.0
014SB	2	0.0	0.0	2.1	0.5	0.4	-	-	-	-	-	-	-	3.0	0.0
014SB	3	0.0	0.0	1.6	0.5	0.3	-	-	-	-	-	-	-	2.4	0.0
014SB	4	0.0	0.0	3.1	0.5	0.7	-	-	-	-	-	-	-	4.3	0.0
014SB	5	0.0	0.0	2.5	0.5	0.4	-	-	-	-	-	-	-	3.4	0.0
014SB	6	0.0	0.0	2.2	0.5	0.8	-	-	-	-	-	-	-	3.5	0.0
014SB	7	0.0	0.0	1.7	0.3	0.8	-	-	-	-	-	-	-	2.8	0.0
014SB	8	0.0	0.0	2.1	0.5	0.6	-	-	-	-	-	-	-	3.2	0.0
014SB	9	0.0	0.0	1.7	0.5	0.8	-	-	-	-	-	-	-	3.0	0.0
014SB	10	0.0	0.0	2.5	0.0	0.9	-	-	-	-	-	-	-	3.4	0.0
014SB	11	0.0	0.0	1.4	0.0	0.6	-	-	-	-	-	-	-	2.0	0.0
014SB	106	0.0	0.0	3.6	1.5	0.8	-	-	-	-	-	-	-	5.9	0.1
015SB	1	0.0	0.0	1.7	0.3	0.1	-	-	-	-	-	-	-	2.1	0.0
015SB	2	0.0	0.0	0.9	0.5	0.2	-	-	-	-	-	-	-	1.7	0.0
015SB	3	0.0	0.0	3.9	0.8	0.5	-	-	-	-	-	-	-	5.2	0.0
015SB	4	0.0	0.0	13.9	2.8	0.7	-	-	-	-	-	-	-	17.4	9.5
015SB	5	0.0	0.0	0.0	0.6	0.0	-	-	-	-	-	-	-	0.6	0.0
015SB	6	0.0	0.0	0.0	0.8	0.0	-	-	-	-	-	-	-	0.8	0.0
015SB	7	0.0	0.0	0.0	0.5	0.0	-	-	-	-	-	-	-	0.5	0.0
015SB	8	0.0	0.0	0.0	0.5	0.0	-	-	-	-	-	-	-	0.5	0.0
670SB	1	0.0	0.0	4.1	0.7	0.6	-	-	-	-	-	-	-	5.4	0.0
670SB	2	0.0	0.0	2.5	0.7	0.5	-	-	-	-	-	-	-	3.7	0.0
670SB	3	0.0	0.0	0.0	9.9	0.0	-	-	-	-	-	-	-	9.9	8.5
670SB	4	0.0	0.0	3.0	1.3	0.5	-	-	-	-	-	-	-	4.8	0.0
670SB	5	0.0	0.0	4.0	2.0	0.7	-	-	-	-	-	-	-	6.7	0.6
670SB	6	0.0	0.0	3.6	0.8	0.7	-	-	-	-	-	-	-	5.0	0.0
670SB	7	0.0	0.0	2.3	0.7	0.4	-	-	-	-	-	-	-	3.4	0.0
670SB	8	0.0	0.0	2.5	1.3	0.5	-	-	-	-	-	-	-	4.3	0.0
670SB	9	0.0	0.0	2.4	0.7	0.5	-	-	-	-	-	-	-	3.6	0.0
670SB	10	0.0	0.0	2.7	0.7	0.7	-	-	-	-	-	-	-	4.1	0.0
670SB	11	0.0	0.0	2.3	0.7	0.2	-	-	-	-	-	-	-	3.3	0.0
670SB	12	0.0	0.0	6.2	0.9	0.4	-	-	-	-	-	-	-	7.6	0.4
670SB	13	0.0	0.0	1.2	0.5	0.2	-	-	-	-	-	-	-	1.9	0.0
670SB	14	0.0	0.0	2.5	0.7	0.6	-	-	-	-	-	-	-	3.8	0.0
670SB	15	0.0	0.0	2.9	0.4	0.2	-	-	-	-	-	-	-	3.4	0.0
670SB	16	0.0	0.0	3.2	0.6	0.7	-	-	-	-	-	-	-	4.5	0.0
670SB	17	0.0	0.0	2.1	0.7	0.4	-	-	-	-	-	-	-	3.3	0.0
670SB	18	0.0	0.0	2.6	0.7	0.4	-	-	-	-	-	-	-	3.8	0.0
670SB	19	0.0	0.0	1.8	0.3	0.6	-	-	-	-	-	-	-	2.8	0.0
670SB	20	0.0	0.0	2.2	0.5	0.3	-	-	-	-	-	-	-	3.0	0.0
670SB	21	0.0	0.0	2.1	0.7	0.4	-	-	-	-	-	-	-	3.1	0.0
670SB	22	0.0	0.0	2.4	0.7	0.4	-	-	-	-	-	-	-	3.5	0.0
670SB	23	0.0	0.0	18.1	0.7	0.5	-	-	-	-	-	-	-	19.4	12.3
670SB	24	0.0	0.0	3.4	0.7	0.0	-	-	-	-	-	-	-	4.1	0.0
670SB	25	0.0	0.0	1.8	0.0	0.3	-	-	-	-	-	-	-	2.2	0.0
670SB	26	0.0	0.0	3.2	0.5	0.7	-	-	-	-	-	-	-	4.4	0.0
670SB	27	0.0	0.0	2.2	0.5	0.5	-	-	-	-	-	-	-	3.1	0.0
670SB	28	0.0	0.0	0.0	0.7	0.0	-	-	-	-	-	-	-	0.7	0.0
670SB	29	0.0	0.0	0.0	9.6	0.0	-	-	-	-	-	-	-	9.6	8.2
670SB	30	0.0	0.0	0.0	0.6	0.0	-	-	-	-	-	-	-	0.6	0.0
670SB	31	0.0	0.0	4.0	66.0	0.8	-	-	-	-	-	-	-	70.9	64.6
670SB	32	0.0	0.0	4.5	1.3	0.9	-	-	-	-	-	-	-	6.8	0.0
670SB	33	0.0	0.0	0.0	0.6	0.0	-	-	-	-	-	-	-	0.6	0.0
670SB	34	0.0	0.0	0.0	2.7	0.0	-	-	-	-	-	-	-	2.7	1.3
670SB	35	0.0	0.0	0.0	0.5	0.0	-	-	-	-	-	-	-	0.5	0.0

SWMU 14 Point Risk (1E-6)
Industrial

Boring No.		Aroclor 1254	Aroclor 1260	As	BEQ	Be	Cu	Ni	Zn	Sb	Hg	Tl	V	Total Point Risk	Total Adj.* Point Risk
684SB	1	0.0	0.0	0.4	1.9	0.1	-	-	-	-	-	-	-	2.5	0.6
684SB	2	0.0	0.0	1.8	0.5	0.2	-	-	-	-	-	-	-	2.6	0.0
684SB	3	0.0	0.0	2.2	10.9	0.5	-	-	-	-	-	-	-	13.6	9.5
684SB	4	0.0	0.0	3.3	6.5	0.7	-	-	-	-	-	-	-	10.5	5.1
684SB	5	0.0	0.0	1.9	0.3	0.4	-	-	-	-	-	-	-	2.7	0.0
684SB	6	0.0	0.0	0.1	0.5	0.0	-	-	-	-	-	-	-	0.6	0.0
684SB	7	0.0	0.1	2.4	0.5	0.5	-	-	-	-	-	-	-	3.5	0.1
684SB	8	0.0	0.0	0.5	0.5	0.2	-	-	-	-	-	-	-	1.2	0.0
684SB	9	0.0	0.0	3.4	0.5	1.1	-	-	-	-	-	-	-	5.0	0.0
684SB	10	0.1	0.1	1.4	0.5	0.3	-	-	-	-	-	-	-	2.3	0.1
684SB	11	0.1	0.1	0.4	2.4	0.1	-	-	-	-	-	-	-	3.0	1.2
684SB	12	0.1	0.1	0.2	0.5	0.1	-	-	-	-	-	-	-	1.0	0.1
684SB	13	0.0	0.0	0.7	0.5	0.1	-	-	-	-	-	-	-	1.4	0.0
684SB	14	0.0	0.0	3.1	0.5	0.9	-	-	-	-	-	-	-	4.5	0.0
684SB	15	0.1	0.1	3.5	1.9	1.0	-	-	-	-	-	-	-	6.6	0.7
684SB	16	0.0	0.0	1.3	0.5	0.4	-	-	-	-	-	-	-	2.1	0.0
684SB	17	0.1	0.1	0.9	0.4	0.3	-	-	-	-	-	-	-	1.7	0.1
684SB	18	0.0	0.0	1.7	0.4	0.4	-	-	-	-	-	-	-	2.4	0.0
684SB	19	0.0	0.0	1.3	0.5	0.3	-	-	-	-	-	-	-	2.2	0.1
684SB	20	0.0	0.0	0.9	2.7	0.7	-	-	-	-	-	-	-	4.4	1.4
684SB	21	0.0	0.0	1.5	32.5	0.1	-	-	-	-	-	-	-	34.1	31.2
684SB	22	0.0	0.0	0.5	0.0	0.4	-	-	-	-	-	-	-	1.0	0.1
684SB	23	0.0	0.0	1.5	0.0	0.4	-	-	-	-	-	-	-	1.9	0.0
684SB	24	0.0	0.0	2.1	0.0	0.9	-	-	-	-	-	-	-	3.0	0.0
684SB	25	0.0	0.0	1.4	0.0	0.5	-	-	-	-	-	-	-	1.9	0.0
684SB	26	0.0	0.0	4.3	0.0	0.7	-	-	-	-	-	-	-	5.0	0.0
684SB	27	0.0	0.0	2.6	0.0	0.5	-	-	-	-	-	-	-	3.1	0.0
684SB	28	0.0	0.0	1.5	0.0	0.2	-	-	-	-	-	-	-	1.7	0.0
684SB	29	0.0	0.0	1.2	0.0	0.3	-	-	-	-	-	-	-	1.5	0.0
684SB	30	0.0	0.0	1.0	0.0	0.1	-	-	-	-	-	-	-	1.1	0.0
684SB	31	0.0	0.0	2.4	0.0	0.5	-	-	-	-	-	-	-	3.0	0.0
684SB	32	0.0	0.0	0.0	0.4	0.0	-	-	-	-	-	-	-	0.4	0.0
684SB	33	0.0	0.0	0.0	0.5	0.0	-	-	-	-	-	-	-	0.5	0.0
684SB	34	0.0	0.0	0.0	0.5	0.0	-	-	-	-	-	-	-	0.5	0.0
684SB	35	0.0	0.0	0.0	35.8	0.0	-	-	-	-	-	-	-	35.8	34.4
684SB	36	0.0	0.0	3.1	2.1	0.5	-	-	-	-	-	-	-	5.7	0.7
684SB	37	0.0	0.0	0.0	0.5	0.0	-	-	-	-	-	-	-	0.5	0.0
684SB	38	0.0	0.0	0.0	0.5	0.0	-	-	-	-	-	-	-	0.5	0.0
684SB	39	0.0	0.0	0.0	0.5	0.0	-	-	-	-	-	-	-	0.5	0.0
684SB	40	0.0	0.0	0.0	0.9	0.0	-	-	-	-	-	-	-	0.9	0.0
684SB	41	0.0	0.0	0.0	0.6	0.0	-	-	-	-	-	-	-	0.6	0.0
684SB	42	0.0	0.0	0.0	0.6	0.0	-	-	-	-	-	-	-	0.6	0.0
684SB	43	0.0	0.0	0.0	5.4	0.0	-	-	-	-	-	-	-	5.4	4.0
684SB	44	0.0	0.0	0.0	13.2	0.0	-	-	-	-	-	-	-	13.2	11.8
Site Risk		0.0	0.0	4.6	6.0	0.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	11.5	-
Adj. Site Risk*		**0.0**	**0.0**	**0.0**	**4.6**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	-	**4.7**

***Adj. Site Risk = Total Site Risk minus background risk for Arsenic (Res: 41E-6; Ind: 5.8E-6), Beryllium (Res.: 11E-6; Ind.: 1.5E-6), and BEQs (Res.: 6.7E-6; Ind.: 1.4E-6)**

Table A.5.4. Combined SWMU 14 Point Risk Reduction (1E-6) Residential

Area-Weighted Risk Reduction Calculations

Point to be Removed		Estimated Area (s.f.)	Cumul. Area	Individual Point Risks Total	Individual Point Risks Above Bckgrnd	Area Weighted Point Risks Total	Area Weighted Point Risks Above Bckgrnd	Site Risk Remaining After Point Removal Total	Site Risk Remaining After Point Removal AW Method Above Bkgd.	Site Risk Remaining After Point Removal UCL Method Above Bkgd.
670SB	31	2338	2338	905.4	850.24	8.5	5.7	60.0	17.6	17.9
684SB	35	3268	5606	464.9	458.17	6.1	4.3	53.9	13.4	14.3
684SB	21	2142	7747	438.5	416.34	3.8	2.5	50.2	10.8	11.2
684SB	44	4694	12441	170.9	164.22	3.2	2.2	46.9	8.6	9.5
670SB	23	2580	15021	195.3	142.32	2.0	1.0	44.9	7.6	9.4
684SB	3	2496	17517	168.9	135.36	1.7	1.0	43.2	6.6	8
015SB	4	488	18005	181.4	127.08	0.4	0.2	42.9	6.4	7.5
670SB	3	2715	20720	128.7	122.02	1.4	0.9	41.5	5.5	6.2
670SB	29	3732	24452	124.6	117.92	1.9	1.3	39.6	4.2	5.1
684SB	4	2616	27068	124.3	77.73	1.3	0.6	38.3	3.6	4.2
684SB	43	3024	30092	70.7	63.96	0.9	0.6	37.4	3.1	3.5
684SB	20	1882	31974	52.3	29.69	0.4	0.2	37.0	2.9	3.1
670SB	34	2942	34916	35.4	28.68	0.4	0.2	36.6	2.7	0
684SB	11	2133	37049	37.7	26.42	0.3	0.2	36.3	2.5	0
670SB	12	2486	39535	78.1	26.10	0.8	0.2	35.5	2.3	0
684SB	36	3468	43003	62.9	20.41	0.9	0.2	34.6	2.1	0
684SB	15	3413	46416	71.6	19.94	1.0	0.2	33.7	1.9	0
670SB	5	2499	48915	73.3	19.87	0.7	0.1	32.9	1.8	0
684SB	1	5000	53915	30.5	18.74	0.6	0.3	32.3	1.5	0
670SB	32	5000	58915	71.5	14.80	1.4	0.2	30.9	1.3	0
GDHSB	106	10000	68915	63.9	13.40	2.6	0.4	28.3	0.9	0
670SB	4	2454	71370	51.9	10.86	0.5	0.1	27.8	0.9	0
670SB	8	2438	73807	46.5	9.79	0.5	0.1	27.4	0.8	0
684SB	40	5000	78807	11.5	4.83	0.2	0.1	27.1	0.7	0
015SB	3	762	79569	54.4	3.84	0.2	0.0	27.0	0.7	0
015SB	6	1481	81051	10.3	3.61	0.1	0.0	26.9	0.7	0
670SB	6	4145	85195	52.6	3.34	0.9	0.0	26.0	0.7	0
670SB	17	2597	87793	35.3	3.09	0.4	0.0	25.7	0.6	0
670SB	1	3724	91517	56.3	3.09	0.8	0.0	24.8	0.6	0
670SB	14	5640	97157	40.1	2.96	0.9	0.0	23.9	0.6	0
670SB	24	4000	101157	43.6	2.90	0.7	0.0	23.2	0.5	-
670SB	18	6288	107445	40.4	2.90	1.0	0.1	22.2	0.5	-
670SB	2	3837	111281	39.3	2.79	0.6	0.0	21.6	0.4	-
670SB	11	2724	114005	35.1	2.71	0.4	0.0	21.2	0.4	-
670SB	9	2493	116498	38.0	2.71	0.4	0.0	20.8	0.4	-
670SB	10	4636	121134	43.3	2.52	0.8	0.0	20.0	0.4	-
670SB	28	7140	128274	9.2	2.49	0.3	0.1	19.8	0.3	-
670SB	22	4000	132274	37.3	2.48	0.6	0.0	19.2	0.3	-
670SB	21	2662	134936	33.2	2.28	0.4	0.0	18.8	0.3	-
670SB	7	2172	137108	35.5	2.00	0.3	0.0	18.5	0.3	-
670SB	16	2435	139544	46.8	1.93	0.5	0.0	18.0	0.2	-
684SB	7	2446	141989	36.7	1.81	0.4	0.0	17.7	0.2	-
684SB	26	3066	145055	50.2	1.76	0.6	0.0	17.1	0.2	-
015SB	5	1997	147052	8.4	1.70	0.1	0.0	17.0	0.2	-

Table A.5.4. Combined SWMU 14 Point Risk Reduction (1E-6)
Residential

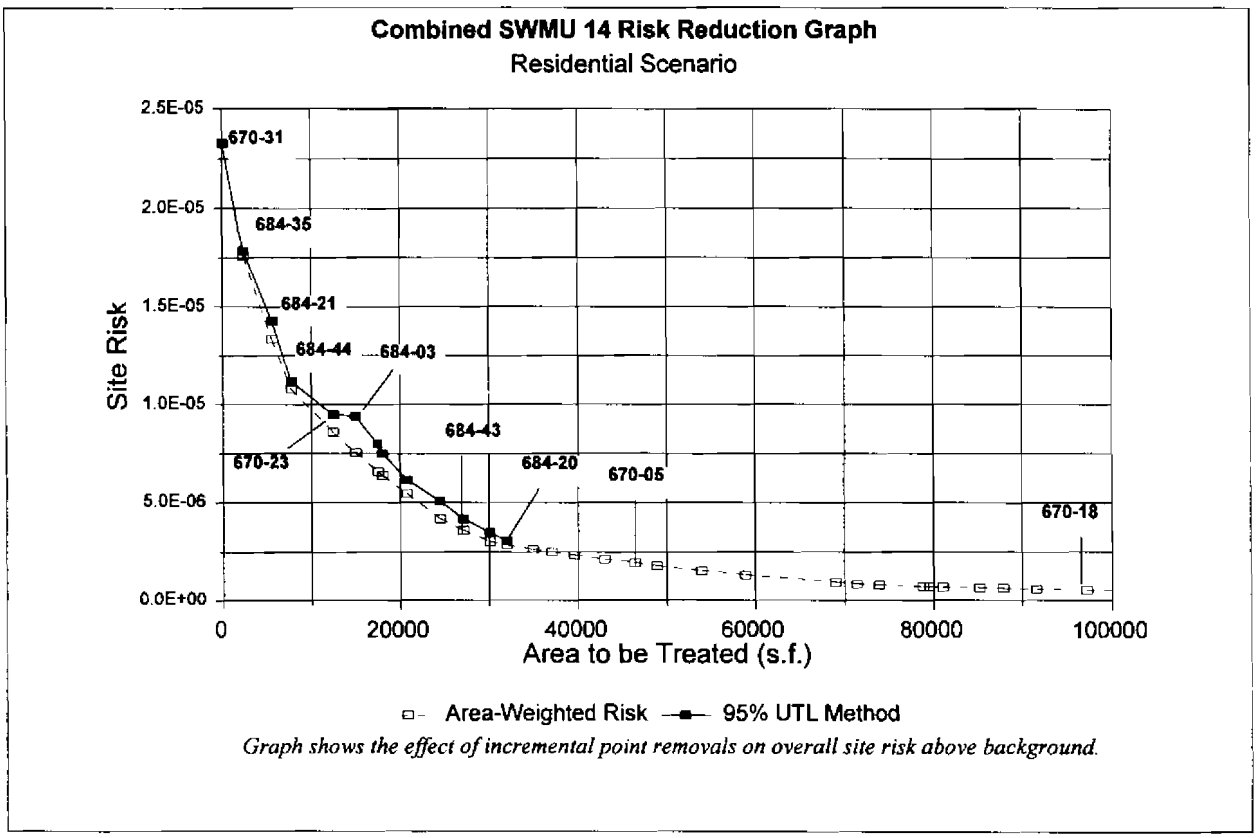
Area-Weighted Risk Reduction Calculations

Point to be Removed		Estimated Area (s.f.)	Cumul. Area	Individual Point Risks Total	Individual Point Risks Above Bckgrnd	Area Weighted Point Risks Total	Area Weighted Point Risks Above Bckgrnd	Site Risk Remaining After Point Removal Total	Site Risk Remaining After Point Removal AW Method Above Bkgd.	Site Risk Remaining After Point Removal UCL Method Above Bkgd.
684SB	17	5861	152914	18.7	1.54	0.4	0.0	16.5	0.2	-
684SB	10	2470	155383	24.4	1.54	0.2	0.0	16.3	0.2	-
684SB	12	2966	158350	11.3	1.54	0.1	0.0	16.1	0.2	-
684SB	41	7000	165350	8.2	1.53	0.2	0.0	15.9	0.1	-
684SB	42	7000	172350	7.8	1.15	0.2	0.0	15.7	0.1	-
670SB	33	7000	179350	7.5	0.76	0.2	0.0	15.5	0.1	-
684SB	19	2292	181642	23.3	0.73	0.2	0.0	15.2	0.1	-
684SB	22	2996	184638	9.7	0.73	0.1	0.0	15.1	0.1	-
670SB	30	7056	191693	7.2	0.50	0.2	0.0	14.9	0.1	-
684SB	9	2664	194358	51.5	0.49	0.6	0.0	14.4	0.1	-
015SB	8	2722	197080	7.1	0.38	0.1	0.0	14.3	0.1	-
684SB	33	5141	202221	7.0	0.32	0.1	0.0	14.2	0.1	-
670SB	25	3606	205827	21.5	0.18	0.3	0.0	13.8	0.1	-
014SB	9	3000	208827	31.2	0.18	0.4	0.0	13.5	0.1	-
014SB	6	2532	211359	35.9	0.18	0.4	0.0	13.1	0.1	-
014SB	8	4938	216297	33.8	0.18	0.7	0.0	12.4	0.1	-
670SB	13	2509	218806	19.9	0.18	0.2	0.0	12.2	0.1	-
684SB	2	2407	221212	27.2	0.18	0.3	0.0	12.0	0.0	-
670SB	15	3373	224585	35.4	0.18	0.5	0.0	11.5	0.0	-
684SB	5	2568	227153	27.7	0.18	0.3	0.0	11.2	0.0	-
684SB	24	2062	229215	30.3	0.18	0.3	0.0	10.9	0.0	-
684SB	13	2577	231792	15.2	0.18	0.2	0.0	10.8	0.0	-
014SB	4	7149	238941	44.2	0.18	1.3	0.0	9.5	0.0	-
670SB	19	2502	241444	29.2	0.18	0.3	0.0	9.2	0.0	-
684SB	30	3000	244444	11.1	0.18	0.1	0.0	9.1	0.0	-
684SB	31	3000	247444	29.7	0.18	0.4	0.0	8.7	0.0	-
670SB	20	2571	250014	31.4	0.18	0.3	0.0	8.4	0.0	-
014SB	7	5280	255294	29.2	0.18	0.6	0.0	7.8	0.0	-
684SB	6	2423	257717	7.4	0.18	0.1	0.0	7.7	0.0	-
014SB	5	2569	260286	35.1	0.18	0.4	0.0	7.4	0.0	-
684SB	14	2604	262890	46.3	0.18	0.5	0.0	6.9	0.0	-
684SB	8	9505	272395	13.6	0.18	0.5	0.0	6.4	0.0	-
684SB	27	2592	274987	30.6	0.18	0.3	0.0	6.0	0.0	-
684SB	18	2274	277261	25.5	0.18	0.2	0.0	5.8	0.0	-
684SB	26	3263	280524	19.2	0.18	0.3	0.0	5.6	0.0	-
670SB	26	2613	283137	45.1	0.18	0.5	0.0	5.1	0.0	-
684SB	23	1612	284750	18.9	0.18	0.1	0.0	5.0	0.0	-
684SB	16	2636	287385	22.7	0.18	0.2	0.0	4.7	0.0	-
015SB	1	3108	290493	22.2	0.18	0.3	0.0	4.4	0.0	-
014SB	3	4393	294886	25.5	0.18	0.4	0.0	4.0	0.0	-
670SB	27	4000	298886	32.7	0.18	0.5	0.0	3.5	0.0	-
684SB	29	3560	302446	14.8	0.18	0.2	0.0	3.3	0.0	-
014SB	2	3854	306301	31.5	0.18	0.5	0.0	2.8	0.0	-
684SB	28	2714	309015	17.1	0.18	0.2	0.0	2.6	0.0	-
014SB	1	4942	313957	27.9	0.18	0.6	0.0	2.0	0.0	-
015SB	2	3773	317730	18.5	0.14	0.3	0.0	1.8	0.0	-

Table A.5.4. Combined SWMU 14 Point Risk Reduction (1E-6)
Residential

Area-Weighted Risk Reduction Calculations

Point to be Removed		Estimated Area (s.f.)	Cumul. Area	Individual Point Risks Total	Individual Point Risks Above Bckgrnd	Area Weighted Point Risks Total	Area Weighted Point Risks Above Bckgrnd	Site Risk Remaining After Point Removal Total	Site Risk Remaining After Point Removal AW Method Above Bkgd.	Site Risk Remaining After Point Removal UCL Method Above Bkgd.
684SB	39	3000	320730	6.3	0.00	0.0	0.0	1.7	0.0	-
684SB	34	5097	325827	6.0	0.00	0.1	0.0	-0.1	0.0	-
684SB	37	7205	333032	6.3	0.00	0.2	0.0	-0.3	0.0	-
684SB	38	4000	337032	6.3	0.00	0.1	0.0	-0.4	0.0	-
014SB	10	4000	341032	34.2	0.00	0.5	0.0	-1.0	0.0	-
015SB	7	1453	342485	6.2	0.00	0.0	0.0	-1.0	0.0	-
014SB	11	6726	349211	20.1	0.00	0.5	0.0	-1.5	0.0	-
684SB	32	3475	352686	5.8	0.00	0.1	0.0	-1.6	0.0	-
670SB	35	5000	357686	6.7	0.00	0.1	0.0	-1.8	0.0	-



Graph shows the effect of incremental point removals on overall site risk above background.

Table A.5.5. Combined SWMU 14 Point Risk Reduction (1E-6)
Industrial

Area-Weighted Risk Reduction Calculations

Point to be Removed		Estimated Area (s.f.)	Cumul. Area	Individual Point Risks Total	Individual Point Risks Above Bckgrnd	Area Weighted Point Risks Total	Area Weighted Point Risks Above Bckgrnd	Site Risk Remaining After Point Removal Total	Site Risk Remaining After Point Removal AW Method Above Bkgd.	Site Risk Remaining After Point Removal UCL Method Above Bkgd.
670SB	31	2338	2338	70.9	64.63	1.3	1.3	10.2	3.4	3.6
684SB	35	3268	5606	35.8	34.42	0.9	1.0	9.3	2.4	2.9
684SB	21	2142	7747	34.1	31.20	0.6	0.6	8.7	1.9	2.2
670SB	23	2580	10328	19.4	12.30	0.4	0.3	8.4	1.6	1.9
684SB	44	4694	15021	13.2	11.77	0.5	0.5	7.9	1.1	1.8
684SB	3	2496	17517	13.6	9.55	0.3	0.2	7.6	0.9	1.6
016SB	4	488	18005	17.4	9.50	0.1	0.0	7.6	0.9	1.5
670SB	3	2715	20720	9.9	8.52	0.2	0.2	7.3	0.7	1.2
670SB	29	3732	24452	9.6	8.20	0.3	0.3	7.1	0.4	1
684SB	4	2616	27068	10.5	5.11	0.2	0.1	6.9	0.3	0.8
684SB	43	3024	30092	5.4	4.04	0.1	0.1	6.7	0.2	0.7
684SB	20	1882	31974	4.4	1.40	0.1	0.0	6.7	0.2	0.6
670SB	34	2942	34916	2.7	1.33	0.1	0.0	6.6	0.2	0
684SB	11	2133	37049	3.0	1.15	0.0	0.0	6.6	0.1	0
684SB	36	3468	40517	5.7	0.69	0.2	0.0	6.4	0.1	0
684SB	15	3413	43930	6.6	0.65	0.2	0.0	6.2	0.1	0
670SB	5	2499	46429	6.7	0.65	0.1	0.0	6.1	0.1	0
684SB	1	5000	51429	2.5	0.56	0.1	0.0	6.0	0.1	0
670SB	12	2486	53915	7.6	0.43	0.1	0.0	5.9	0.0	0
GDHSB	106	10000	63915	5.9	0.15	0.5	0.0	5.4	0.0	0
684SB	7	2446	66361	3.5	0.14	0.1	0.0	5.3	0.0	0
684SB	12	2966	69327	1.0	0.12	0.0	0.0	5.3	0.0	0
684SB	17	5861	75188	1.7	0.12	0.1	0.0	5.2	0.0	0
684SB	10	2470	77658	2.3	0.12	0.0	0.0	5.2	0.0	0
684SB	22	2996	80654	1.0	0.06	0.0	0.0	5.2	0.0	0
684SB	19	2292	82946	2.2	0.06	0.0	0.0	5.1	0.0	0
670SB	8	2438	85383	4.3	0.02	0.1	0.0	5.1	0.0	0
670SB	16	2435	87819	4.5	0.02	0.1	0.0	5.0	0.0	0
670SB	18	6288	94107	3.8	0.02	0.2	0.0	4.8	0.0	0
670SB	17	2597	96704	3.3	0.02	0.1	0.0	4.7	0.0	0
670SB	2	3837	100541	3.7	0.02	0.1	0.0	4.6	0.0	-
670SB	1	3724	104265	5.4	0.02	0.2	0.0	4.4	0.0	-
016SB	3	762	105027	5.2	0.02	0.0	0.0	4.4	0.0	-
670SB	4	2454	107482	4.8	0.02	0.1	0.0	4.3	0.0	-
670SB	11	2724	110205	3.3	0.02	0.1	0.0	4.3	0.0	-
670SB	10	4636	114842	4.1	0.02	0.1	0.0	4.1	0.0	-
670SB	9	2493	117334	3.6	0.02	0.1	0.0	4.0	0.0	-
670SB	24	4000	121334	4.1	0.02	0.1	0.0	3.9	0.0	-
670SB	6	4145	125479	5.0	0.02	0.2	0.0	3.7	0.0	-
684SB	24	2062	127541	3.0	0.01	0.0	0.0	3.7	0.0	-
684SB	13	2577	130118	1.4	0.01	0.0	0.0	3.7	0.0	-
014SB	1	4942	135059	2.7	0.01	0.1	0.0	3.6	0.0	-
014SB	4	7149	142209	4.3	0.01	0.2	0.0	3.3	0.0	-
014SB	5	2569	144778	3.4	0.01	0.1	0.0	3.3	0.0	-
670SB	14	5640	150417	3.8	0.01	0.2	0.0	3.1	0.0	-
014SB	3	4393	154810	2.4	0.01	0.1	0.0	3.0	0.0	-

Table A.5.5. Combined SWMU 14 Point Risk Reduction (1E-6)
Industrial

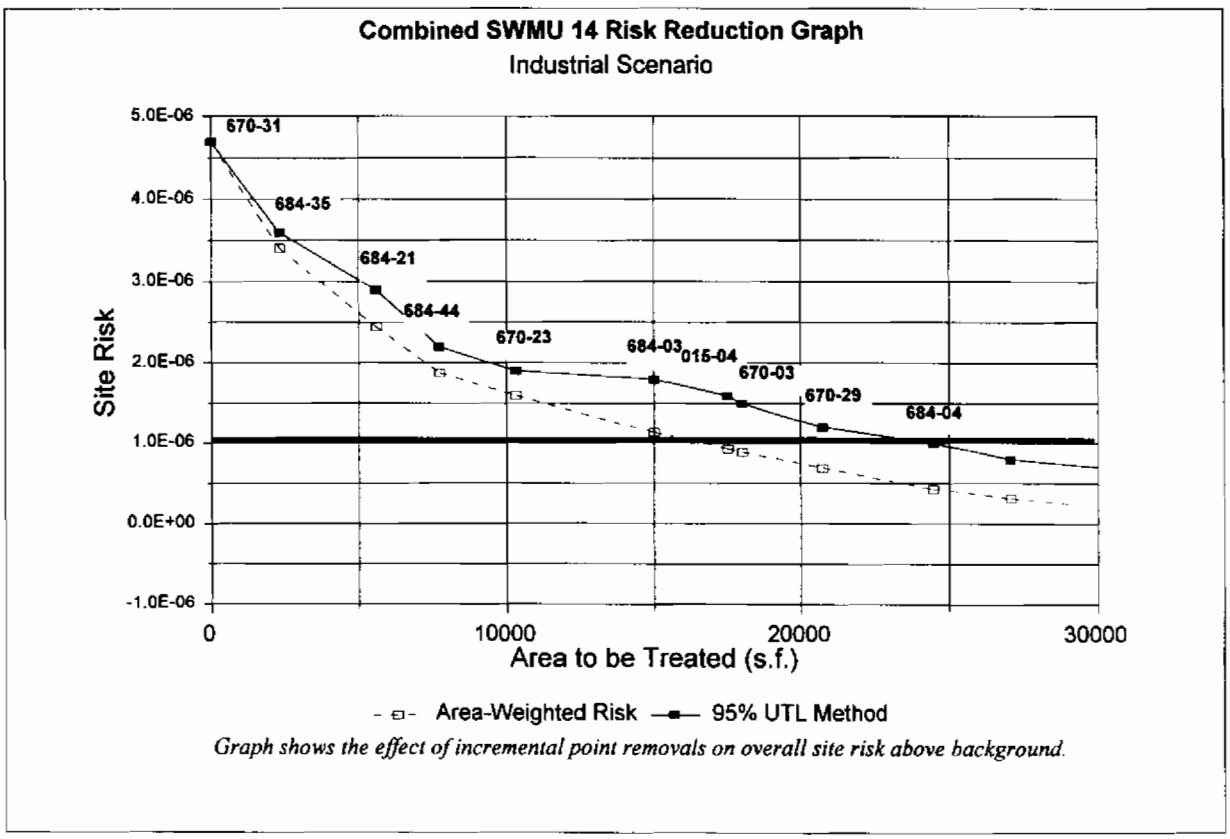
Area-Weighted Risk Reduction Calculations

Point to be Removed		Estimated Area (s.f.)	Cumul. Area	Individual Point Risks Total	Individual Point Risks Above Bckgrnd	Area Weighted Point Risks Total	Area Weighted Point Risks Above Bckgrnd	Site Risk Remaining After Point Removal Total	Site Risk Remaining After Point Removal AW Method Above Bkgd.	Site Risk Remaining After Point Removal UCL Method Above Bkgd.
684SB	8	9505	164316	1.2	0.01	0.1	0.0	2.9	0.0	-
684SB	9	2664	166980	5.0	0.01	0.1	0.0	2.8	0.0	-
670SB	7	2172	169152	3.4	0.01	0.1	0.0	2.8	0.0	-
684SB	28	2714	171866	1.7	0.01	0.0	0.0	2.7	0.0	-
684SB	6	2568	174434	2.7	0.01	0.1	0.0	2.7	0.0	-
684SB	25	3263	177697	1.9	0.01	0.0	0.0	2.6	0.0	-
684SB	16	2636	180333	2.1	0.01	0.0	0.0	2.6	0.0	-
684SB	18	2274	182607	2.4	0.01	0.0	0.0	2.5	0.0	-
015SB	2	3773	186380	1.7	0.01	0.0	0.0	2.5	0.0	-
684SB	23	1612	187992	1.9	0.01	0.0	0.0	2.5	0.0	-
014SB	8	4938	192930	3.2	0.01	0.1	0.0	2.4	0.0	-
670SB	19	2502	195433	2.8	0.01	0.1	0.0	2.3	0.0	-
670SB	32	5000	200433	6.8	0.01	0.3	0.0	2.0	0.0	-
670SB	20	2571	203003	3.0	0.01	0.1	0.0	2.0	0.0	-
670SB	25	3606	206609	2.2	0.01	0.1	0.0	1.9	0.0	-
684SB	29	3560	210169	1.5	0.01	0.0	0.0	1.9	0.0	-
014SB	2	3854	214024	3.0	0.01	0.1	0.0	1.8	0.0	-
670SB	15	3373	217397	3.4	0.01	0.1	0.0	1.7	0.0	-
670SB	26	2613	220010	4.4	0.01	0.1	0.0	1.6	0.0	-
014SB	9	3000	223010	3.0	0.01	0.1	0.0	1.5	0.0	-
014SB	6	2532	225542	3.5	0.01	0.1	0.0	1.5	0.0	-
684SB	30	3000	228542	1.1	0.01	0.0	0.0	1.4	0.0	-
684SB	27	2592	231134	3.1	0.01	0.1	0.0	1.4	0.0	-
684SB	26	3066	234200	5.0	0.01	0.1	0.0	1.3	0.0	-
014SB	7	5280	239480	2.8	0.01	0.1	0.0	1.1	0.0	-
684SB	31	3000	242480	3.0	0.01	0.1	0.0	1.1	0.0	-
684SB	6	2423	244903	0.6	0.01	0.0	0.0	1.1	0.0	-
670SB	21	2662	247565	3.1	0.01	0.1	0.0	1.0	0.0	-
684SB	2	2407	249971	2.6	0.01	0.0	0.0	1.0	0.0	-
670SB	13	2509	252480	1.9	0.01	0.0	0.0	0.9	0.0	-
670SB	27	4000	256480	3.1	0.01	0.1	0.0	0.8	0.0	-
015SB	1	3108	259588	2.1	0.01	0.1	0.0	0.8	0.0	-
670SB	22	4000	263588	3.5	0.01	0.1	0.0	0.7	0.0	-
684SB	14	2604	266191	4.5	0.01	0.1	0.0	0.6	-0.0	-
670SB	30	7056	273247	0.6	0.00	0.0	0.0	0.5	-0.0	-
684SB	37	7205	280452	0.5	0.00	0.0	0.0	0.5	-0.0	-
684SB	38	4000	284452	0.5	0.00	0.0	0.0	0.5	-0.0	-
684SB	39	3000	287452	0.5	0.00	0.0	0.0	0.5	-0.0	-
684SB	42	7000	294452	0.6	0.00	0.0	0.0	0.5	-0.0	-
670SB	28	7140	301593	0.7	0.00	0.0	0.0	0.4	-0.0	-
684SB	40	5000	306593	0.9	0.00	0.0	0.0	0.4	-0.0	-
684SB	41	7000	313593	0.6	0.00	0.0	0.0	0.3	-0.0	-

Table A.5.5. Combined SWMU 14 Point Risk Reduction (1E-6) Industrial

Area-Weighted Risk Reduction Calculations

Point to be Removed		Estimated Area (s.f.)	Cumul. Area	Individual Point Risks Total	Individual Point Risks Above Bckgrnd	Area Weighted Point Risks Total	Area Weighted Point Risks Above Bckgrnd	Site Risk Remaining After Point Removal Total	Site Risk Remaining After Point Removal AW Method Above Bkgd.	Site Risk Remaining After Point Removal UCL Method Above Bkgd.
015SB	6	1481	315074	0.8	0.00	0.0	0.0	0.3	-0.0	-
015SB	7	1453	316527	0.5	0.00	0.0	0.0	0.3	-0.0	-
015SB	5	1997	318525	0.6	0.00	0.0	0.0	0.3	-0.0	-
014SB	11	6726	325251	2.0	0.00	0.1	0.0	0.2	-0.0	-
014SB	10	4000	329251	3.4	0.00	0.1	0.0	0.1	-0.0	-
015SB	8	2722	331973	0.5	0.00	0.0	0.0	0.1	-0.0	-
684SB	33	5141	337114	0.5	0.00	0.0	0.0	0.1	-0.0	-
684SB	34	5097	342211	0.5	0.00	0.0	0.0	0.1	-0.0	-
684SB	32	3475	345686	0.4	0.00	0.0	0.0	0.1	-0.0	-
670SB	35	5000	350686	0.5	0.00	0.0	0.0	0.0	-0.0	-
670SB	33	7000	357686	0.6	0.00	0.0	0.0	0.0	-0.0	-



Graph shows the effect of incremental point removals on overall site risk above background.

Charleston Naval Base
Zone H
Corrective Measures
Work Plan

Combined SWMU 14
Thiessen Soil Risk Reduction Polygons

Soil_pts.shp
Soil Sample Locations
Soil_the.shp
Risk -- Thiessen polygons
Grid_50.shp
50 -Foot Grid
Water
Pier
Road
Bldg
Fence

N
W
E
S

1:114

Table A.6.1. SWMU 17 Surface Soil Concentration Summary

Boring No.		Aroclor1254 mg/kg	Aroclor1260 mg/kg	BEQ mg/kg
017SB	1	0.02	1.86	0.43
"	2	0.02	23.10	0.50
"	3	0.02	0.16	0.41
"	4	0.02	3.85	0.44
"	5	0.02	0.03	0.43
"	6	0.02	18.00	0.50
"	7	0.02	0.04	0.46
"	8	0.02	0.04	0.47
"	9	0.03	6.42	0.37
"	10	0.02	0.37	0.45
"	11	0.02	0.19	0.49
"	12	0.03	0.02	0.45
"	13	0.02	0.06	0.45
"	14	0.02	0.34	0.44
"	15	0.02	0.05	0.43
"	16	0.02	0.07	0.47
"	17	0.02	0.02	0.42
"	18	0.02	0.02	0.45
"	19	0.02	1.90	0.46
"	20	0.02	180.00	0.90
"	21	0.02	0.04	0.46
"	22	0.02	0.49	0.44
"	23	0.02	1.00	0.47
"	24	0.02	0.06	0.46
"	25	0.02	0.16	0.50
"	26	0.02	0.02	0.50
"	27	0.02	0.39	NS
"	28	0.02	0.18	NS
"	29	0.02	0.53	NS
"	30	0.02	0.31	NS
"	31	0.02	0.10	NS
"	32	0.02	0.05	NS
"	33	0.02	0.02	NS

		Log Transformed Data					
	n	standard deviation*	mean	H-value	95% UCL mg/kg	Max mg/kg	EPC mg/kg
Aroclor 1254	33	0.100	-3.904	1.699	0.02	0.10	0.02
Aroclor 1260	33	2.312	-1.407	4.264	20.27	180.00	20.27
B(a)P Eq. (BEQs)	26	0.100	-0.765	1.699	0.48	0.90	0.48

Note: - shaded values were not detected; value given represents ½ the SQL.

* - standard deviations less than 0.10 are rounded up to 0.10

NS - parameter was not sampled for

Table A.6.2 SWMU 17 Hazard Quotients and Incremental Lifetime Cancer Risks

Incidental Surface Soil Ingestion

Chemical	Oral RfD Used (mg/kg-day)	Oral SF Used (mg/kg-day)-1	Future Resident adult Hazard Quotient	Future Resident child Hazard Quotient	Future Resident Iwa ILCR	Site Worker adult Hazard Quotient	Site Worker adult ILCR
Aroclor 1254	2E-05	2	0.0014	0.013	6.5E-08	0.0005	7.3E-09
Aroclor 1260	NA	2	ND	ND	6.3E-05	ND	7.1E-06
Benzo(a)pyrene equiv.	NA	7.3	ND	ND	5.5E-06	ND	6.1E-07
Total Incidental Ingestion Pathway Risk & Hazard:			1.4E-03	1.3E-02	6.9E-05	5.1E-04	7.7E-06

Dermal Contact With Surface Soil

Chemical	Dermal Adjustment	Oral RfD Used (mg/kg-day)	Oral SF Used (mg/kg-day)-1	Future Resident adult Hazard Quotient	Future Resident child Hazard Quotient	Future Resident Iwa ILCR	Site Worker adult Hazard Quotient	Site Worker adult ILCR
Aroclor 1254	0.5	1E-05	4	0.0012	0.004	2.9E-08	0.0008	1.2E-08
Aroclor 1260	0.5	NA	4	ND	ND	2.9E-05	ND	1.2E-05
Benzo(a)pyrene equiv.	0.5	NA	14.6	ND	ND	2.5E-06	ND	1.0E-06
Total Dermal Pathway Risk & Hazard:				1.2E-03	3.9E-03	3.1E-05	8.4E-04	1.3E-05
Sum of All Soil Pathways:				2.6E-03	1.7E-02	1.0E-04	1.3E-03	2.0E-05

NOTES:

- **NA** Not available
- **ND** Not Determined due to lack of available information
- **ILCR** Incremental Lifetime Cancer Risk
- **Dermal Adj.** Dermal to absorbed dose adjustment factor is applied to adjust for Oral SF and RfD (i.e., the oral RfD is based on oral absorption efficiency which should not be applied to dermal exposure and dermal CDI)

Table A.6.3. SWMU 17 Point Risk (1E-6)

	Aroclor 1254	Aroclor 1260	As	BEQ	Be	Cu	Ni	Zn
SF (ing)	2	2	1.5	7.3	4.3	NA	NA	NA
SF (der)	4	4	7.5	14.6	21.5	NA	NA	NA
DAF	0.01	0.01	0.001	0.01	0.001	0.001	0.001	0.001

Residential

Boring No.		Aroclor 1254	Aroclor 1260	As	BEQ	Be	Cu	Ni	Zn	Total Point Risk	Risk Above Background
017SB	1	0.1	8.4	-	7.1	-	-	-	-	15.6	8.9
"	2	0.1	104.8	-	8.4	-	-	-	-	113.3	106.6
"	3	0.1	0.7	-	6.9	-	-	-	-	7.7	1.0
"	4	0.1	17.5	-	7.3	-	-	-	-	24.8	18.1
"	5	0.1	0.1	-	7.1	-	-	-	-	7.3	0.6
"	6	0.1	81.7	-	8.2	-	-	-	-	90.0	83.3
"	7	0.1	0.2	-	7.7	-	-	-	-	7.9	1.2
"	8	0.1	0.2	-	7.8	-	-	-	-	8.1	1.4
"	9	0.1	29.1	-	6.2	-	-	-	-	35.4	29.2
"	10	0.1	1.7	-	7.4	-	-	-	-	9.2	2.5
"	11	0.1	0.8	-	8.0	-	-	-	-	9.0	2.3
"	12	0.1	0.1	-	7.5	-	-	-	-	7.7	1.0
"	13	0.1	0.3	-	7.5	-	-	-	-	7.8	1.1
"	14	0.1	1.5	-	7.3	-	-	-	-	8.9	2.2
"	15	0.1	0.2	-	7.1	-	-	-	-	7.4	0.7
"	16	0.1	0.3	-	7.8	-	-	-	-	8.2	1.5
"	17	0.1	0.1	-	6.9	-	-	-	-	7.1	0.4
"	18	0.1	0.1	-	7.5	-	-	-	-	7.6	0.9
"	19	0.1	8.6	-	7.7	-	-	-	-	16.4	9.7
"	20	0.1	816.7	-	14.9	-	-	-	-	831.7	825.0
"	21	0.1	0.2	-	7.7	-	-	-	-	7.9	1.2
"	22	0.1	2.2	-	7.3	-	-	-	-	9.6	2.9
"	23	0.1	4.5	-	7.8	-	-	-	-	12.5	5.8
"	24	0.1	0.3	-	7.7	-	-	-	-	8.0	1.3
"	25	0.1	0.7	-	8.2	-	-	-	-	9.0	2.3
"	26	0.1	0.1	-	8.2	-	-	-	-	8.4	1.7
"	27	0.1	1.8	-	NS	-	-	-	-	1.9	1.9
"	28	0.1	0.8	-	NS	-	-	-	-	0.9	0.9
"	29	0.1	2.4	-	NS	-	-	-	-	2.5	2.5
"	30	0.1	1.4	-	NS	-	-	-	-	1.5	1.5
"	31	0.1	0.4	-	NS	-	-	-	-	0.5	0.5
"	32	0.1	0.2	-	NS	-	-	-	-	0.3	0.3
"	33	0.1	0.1	-	NS	-	-	-	-	0.2	0.2
Site Risk		0.1	92.0	-	8.0	-	-	-	-	100.0	-
Adj. Site Risk*		**0.1**	**92.0**	-	**1.3**	-	-	-	-	-	**93.3**

SWMU 17 Point Risk (1E-6) cont.

Industrial

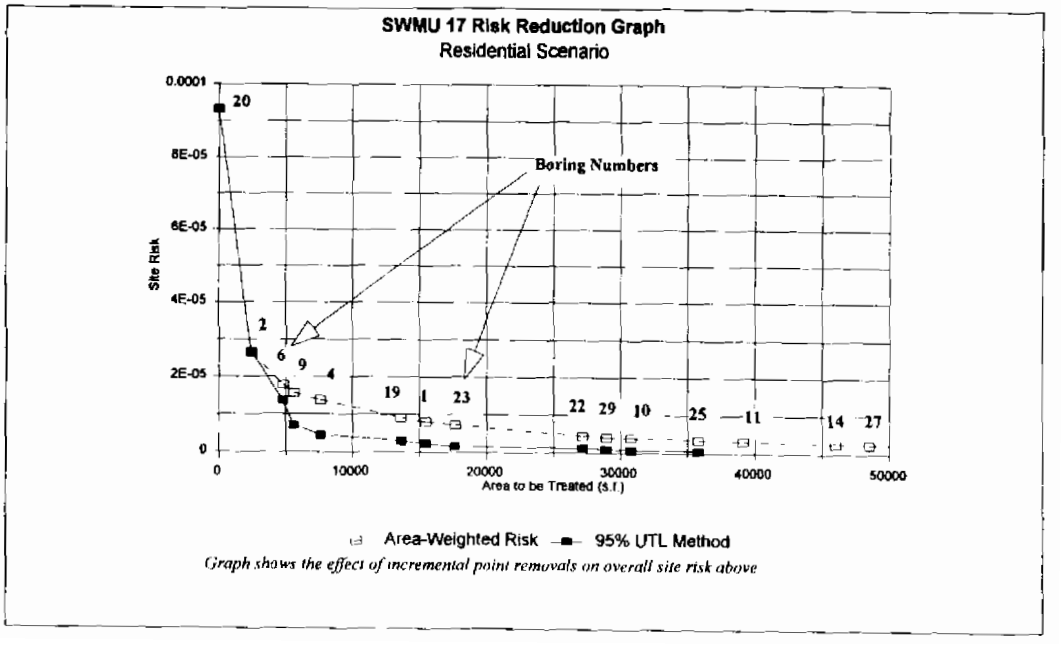
Boring No.		Aroclor 1254	Aroclor 1260	As	BEQ	Be	Cu	Ni	Zn	Total Point Risk	Risk Above Background
017SB	1	0.0	0.7	-	0.5	-	-	-	-	1.2	0.66
"	2	0.0	8.1	-	0.6	-	-	-	-	8.7	8.08
"	3	0.0	0.1	-	0.5	-	-	-	-	0.6	0.06
"	4	0.0	1.3	-	0.6	-	-	-	-	1.9	1.35
"	5	0.0	0.0	-	0.5	-	-	-	-	0.6	0.02
"	6	0.0	6.3	-	0.6	-	-	-	-	6.9	6.30
"	7	0.0	0.0	-	0.6	-	-	-	-	0.6	0.02
"	8	0.0	0.0	-	0.6	-	-	-	-	0.6	0.02
"	9	0.0	2.2	-	0.5	-	-	-	-	2.7	2.25
"	10	0.0	0.1	-	0.6	-	-	-	-	0.7	0.14
"	11	0.0	0.1	-	0.6	-	-	-	-	0.7	0.07
"	12	0.0	0.0	-	0.6	-	-	-	-	0.6	0.02
"	13	0.0	0.0	-	0.6	-	-	-	-	0.6	0.03
"	14	0.0	0.1	-	0.6	-	-	-	-	0.7	0.12
"	15	0.0	0.0	-	0.5	-	-	-	-	0.6	0.03
"	16	0.0	0.0	-	0.6	-	-	-	-	0.6	0.03
"	17	0.0	0.0	-	0.5	-	-	-	-	0.5	0.01
"	18	0.0	0.0	-	0.6	-	-	-	-	0.6	0.01
"	19	0.0	0.7	-	0.6	-	-	-	-	1.3	0.67
"	20	0.0	62.9	-	1.2	-	-	-	-	64.1	62.93
"	21	0.0	0.0	-	0.6	-	-	-	-	0.6	0.02
"	22	0.0	0.2	-	0.6	-	-	-	-	0.7	0.18
"	23	0.0	0.3	-	0.6	-	-	-	-	1.0	0.36
"	24	0.0	0.0	-	0.6	-	-	-	-	0.6	0.03
"	25	0.0	0.1	-	0.6	-	-	-	-	0.7	0.06
"	26	0.0	0.0	-	0.6	-	-	-	-	0.6	0.01
"	27	0.0	0.1	-	NS	-	-	-	-	0.1	0.14
"	28	0.0	0.1	-	NS	-	-	-	-	0.1	0.07
"	29	0.0	0.2	-	NS	-	-	-	-	0.2	0.19
"	30	0.0	0.1	-	NS	-	-	-	-	0.1	0.12
"	31	0.0	0.0	-	NS	-	-	-	-	0.0	0.04
"	32	0.0	0.0	-	NS	-	-	-	-	0.0	0.02
"	33	0.0	0.0	-	NS	-	-	-	-	0.0	0.01
Site Risk		0.0	18.7	-	1.6	-	-	-	-	20.3	-
Adj. Site Risk*		**0.0**	**18.7**	-	**0.2**	-	-	-	-	-	**18.9**

***Adj. Site Risk = Total Site Risk minus background risk for Arsenic (Res: 41E-6; Ind: 5.8E-6), Beryllium (Res.: 11E-6; Ind.: 1.5E-6), and BEQs (Res.: 6.7E-6; Ind.: 1.4E-6)**

Table A.6.4. SWMU 17 Point Risk Reduction (1E-6)
Residential

Area-Weighted Risk Reduction Calculations

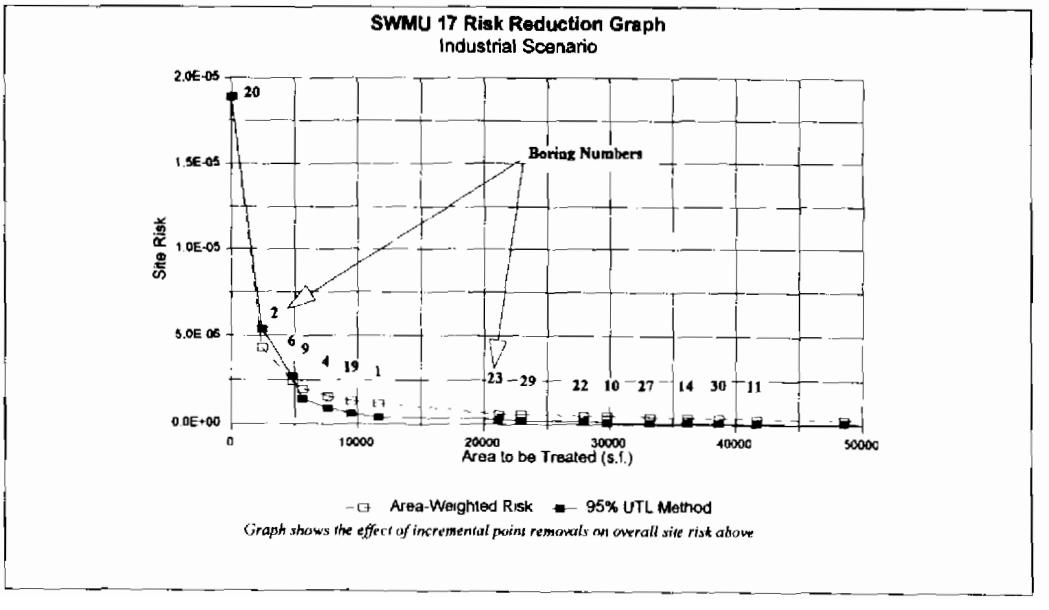
Point to be Removed		Estimated Area (s.f.)	Cumul. Area	Individual Point Risks		Area Weighted Point Risks		Site Risk Remaining After Point Removal		
				Total	Above Bckgrnd	Total	Above Bckgrnd	Total	AW Method Above Bkgd.	UCL Method Above Bkgd.
017SB	20	2420	2420	831.7	825.0	61.1	66.7	38.9	26.6	26.8
017SB	2	2432	4852	113.3	106.6	8.4	8.7	30.5	17.9	13.6
017SB	6	772	5624	90.0	83.3	2.1	2.2	28.4	15.7	7.0
017SB	9	2002	7626	35.4	29.2	2.2	2.0	26.3	13.8	4.5
017SB	25	6000	13626	9.0	23.0	1.6	4.6	24.6	9.2	3.0
017SB	4	1855	15481	24.8	18.1	1.4	1.1	23.2	8.0	2.2
017SB	19	2168	17650	16.4	9.7	1.1	0.7	22.2	7.3	1.6
017SB	1	9506	27155	15.6	8.9	4.5	2.8	17.7	4.5	1.2
017SB	23	1791	28946	12.5	5.8	0.7	0.3	17.0	4.2	1.0
017SB	22	1832	30778	9.6	2.9	0.5	0.2	16.4	4.0	0.8
017SB	29	5000	35778	2.5	2.5	0.4	0.4	16.1	3.6	0.6
017SB	10	3368	39146	9.2	2.5	0.9	0.3	15.1	3.3	0.4
017SB	11	6850	45996	9.0	2.3	1.9	0.5	13.3	2.8	0.3
017SB	14	2500	48496	8.9	2.2	0.7	0.2	12.6	2.6	0.2
017SB	27	3000	51496	1.9	1.9	0.2	0.2	12.4	2.4	0.1
017SB	26	10000	61496	8.4	1.7	2.6	0.6	9.9	1.8	0.1
017SB	16	734	62231	8.2	1.5	0.2	0.0	9.7	1.8	0.1
017SB	30	2999	65230	1.5	1.5	0.1	0.2	9.5	1.6	0.1
017SB	8	1956	67185	8.1	1.4	0.5	0.1	9.1	1.5	0.1
017SB	24	12000	79185	8.0	1.3	2.9	0.5	6.1	1.0	0.1
017SB	7	1242	80427	7.9	1.2	0.3	0.0	5.8	1.0	0.1
017SB	21	2731	83158	7.9	1.2	0.7	0.1	5.2	0.9	0.1
017SB	13	829	83987	7.8	1.1	0.2	0.0	5.0	0.8	0.1
017SB	3	6442	90429	7.7	1.0	1.5	0.2	3.5	0.6	0.1
017SB	12	5000	95429	7.7	1.0	1.2	0.2	2.3	0.4	0.1
017SB	28	4000	99429	0.9	0.9	0.1	0.1	2.2	0.3	0.1
017SB	18	3000	102429	7.6	0.9	0.7	0.1	1.5	0.2	0.1
017SB	15	2500	104929	7.4	0.7	0.6	0.1	1.0	0.2	0.1
017SB	5	1393	106322	7.3	0.6	0.3	0.0	0.6	0.1	0.1
017SB	31	2794	109116	0.5	0.5	0.0	0.0	0.6	0.1	0.1
017SB	17	2500	111616	7.1	0.4	0.5	0.0	0.1	0.1	0.1
017SB	32	4000	115616	0.3	0.3	0.0	0.0	0.0	0.0	0.1
017SB	33	4040	119656	0.2	0.2	0.0	0.0	0.0	-0.0	0.1

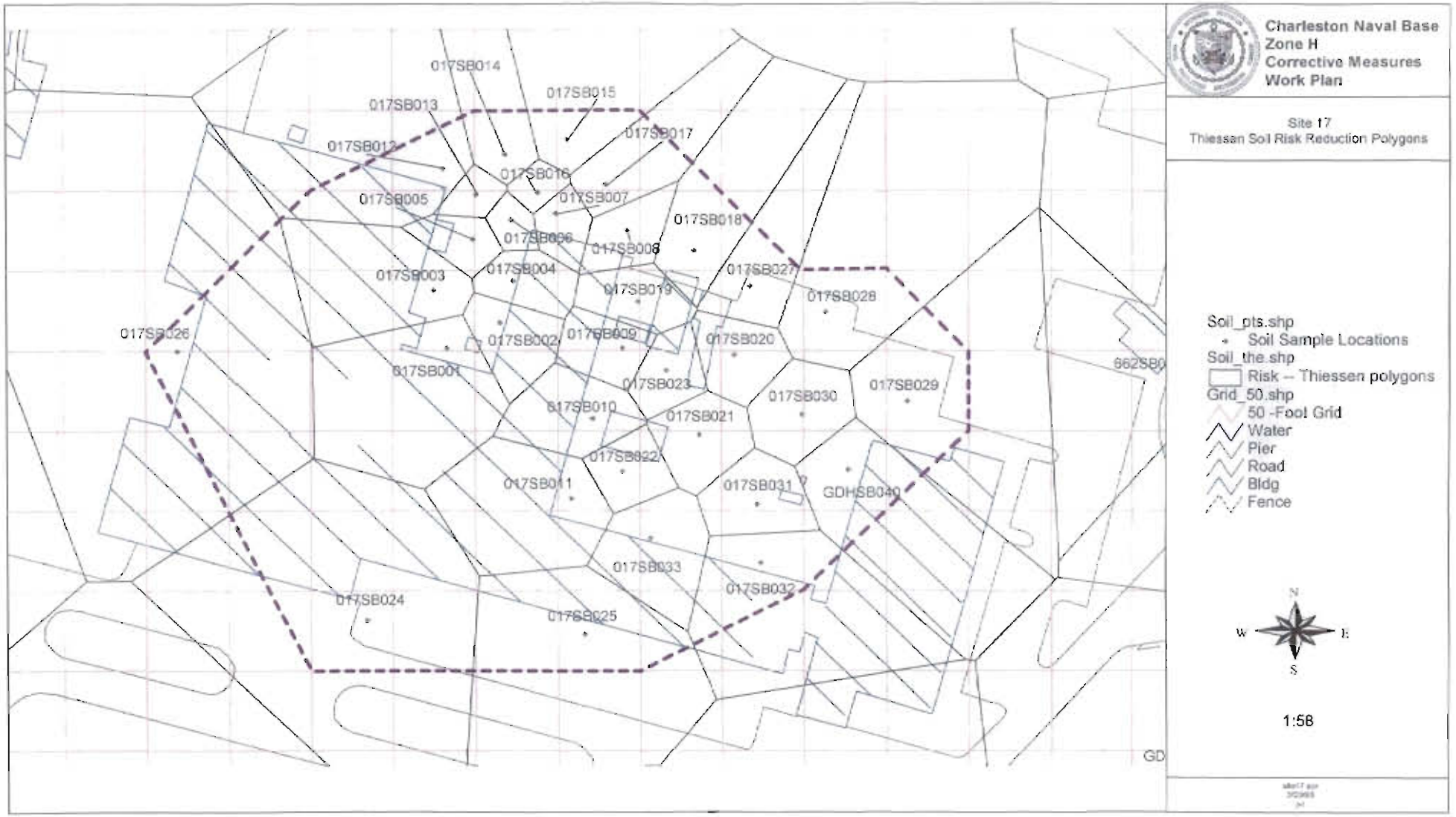


Graph shows the effect of incremental point removals on overall site risk above

Table A.6.5. SWMU 17 Point Risk Reduction (1E-6)
Industrial
Area-Weighted Risk Reduction Calculations

Point to be Removed		Estimated Area (s.f.)	Cumul. Area	Individual Point Risks		Area Weighted Point Risks		Site Risk Remaining After Point Removal		
				Total	Above Bckgrnd	Total	Above Bckgrnd	Total	AW Method Above Bkgd.	UCL Method Above Bkgd.
017SB	20	2420	2420	64.1	62.93	12.5	14.6	7.8	4.3	5.4
017SB	2	2432	4852	8.7	8.08	1.7	1.9	6.1	2.5	2.7
017SB	6	772	5624	6.9	6.30	0.4	0.5	5.7	2.0	1.4
017SB	9	2002	7626	2.7	2.25	0.4	0.4	5.3	1.6	0.9
017SB	4	1855	9481	1.9	1.35	0.3	0.2	5.0	1.3	0.6
017SB	19	2168	11650	1.3	0.67	0.2	0.1	4.8	1.2	0.4
017SB	1	9506	21155	1.2	0.66	0.9	0.6	3.9	0.6	0.3
017SB	23	1791	22946	1.0	0.36	0.1	0.0	3.7	0.6	0.2
017SB	29	5000	27946	0.2	0.19	0.1	0.1	3.7	0.5	0.2
017SB	22	1832	29778	0.7	0.18	0.1	0.0	3.6	0.5	0.1
017SB	10	3368	33146	0.7	0.14	0.2	0.0	3.4	0.4	0.1
017SB	27	3000	36146	0.1	0.14	0.0	0.0	3.4	0.4	0.1
017SB	14	2500	38646	0.7	0.12	0.1	0.0	3.2	0.4	0.1
017SB	30	2999	41645	0.1	0.12	0.0	0.0	3.2	0.3	0.1
017SB	11	6850	48495	0.7	0.07	0.4	0.0	2.8	0.3	0.1
017SB	28	4000	52495	0.1	0.07	0.0	0.0	2.8	0.3	0.1
017SB	25	6000	58495	0.7	0.06	0.3	0.0	2.5	0.2	0.1
017SB	3	6442	64937	0.6	0.06	0.3	0.0	2.2	0.2	0.1
017SB	31	2794	67731	0.0	0.04	0.0	0.0	2.2	0.2	0.1
017SB	13	829	68560	0.6	0.03	0.0	0.0	2.1	0.2	0.1
017SB	16	734	69295	0.6	0.03	0.0	0.0	2.1	0.2	0.1
017SB	15	2500	71795	0.6	0.03	0.1	0.0	2.0	0.2	0.1
017SB	24	12000	83795	0.6	0.03	0.6	0.0	1.4	0.1	0.1
017SB	5	1393	85188	0.6	0.02	0.1	0.0	1.3	0.1	0.1
017SB	12	5000	90188	0.6	0.02	0.2	0.0	1.1	0.1	0.1
017SB	21	2731	92919	0.6	0.02	0.0	0.0	1.1	0.1	0.1
017SB	32	4000	96919	0.0	0.02	0.0	0.0	1.1	0.1	0.1
017SB	7	1242	98160	0.6	0.02	0.1	0.0	1.0	0.1	0.1
017SB	8	1956	100116	0.6	0.02	0.1	0.0	0.9	0.1	0.1
017SB	26	10000	110116	0.6	0.01	0.5	0.0	0.4	0.1	0.1
017SB	17	2500	112616	0.5	0.01	0.1	0.0	0.3	0.1	0.1
017SB	33	4040	116656	0.0	0.01	0.0	0.0	0.3	0.1	0.1
017SB	18	3000	119656	0.6	0.01	0.1	0.0	0.2	0.1	0

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017SB015
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017SB018
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017SB029
017SB030
017SB010
017SB021
017SB022
017SB011
017SB031
GDHSB040
017SB033
017SB032
017SB024
017SB025
Charleston Naval Base
Zone H
Corrective Measures
Work Plan
Site 17
Thiessen Soil Risk Reduction Polygons
Soil_pts.shp
Soil Sample Locations
Soil_the.shp
Risk -- Thiessen polygons
Grid_50.shp
50 -Foot Grid
Water
Pier
Road
Bldg
Fence
N
W
E
S
1:58

Table A.7.1 SWMU 136/ AOC 663 Surface Soil Concentration Summary

Boring No.		Aroclor1254 mg/kg	4-4'-DDE mg/kg	As mg/kg	BEQ mg/kg
663SB	**1**	0.036	0.03	5.8	0.33
663SB	**2**	0.036	0.03	3.4	0.46
663SB	**4**	0.036	4.48	18.7	0.46
663SB	**5**	0.039	0.39	5.4	0.50
663SB	**6**	0.020	0.00	9.0	0.46
663SB	**7**	0.020	0.09	6.2	4.42
663SB	**9**	NA	NA	NA	0.49
136SB	**2**	0.695	0.03	7.3	1.32
136SB	**3**	0.020	0.00	11.4	0.47
136SB	**4**	0.025	0.00	23.9	0.64

Notes: **shaded values were not detected; value given represents ½ the SQL.**
NA parameter not analyzed for in sample

		Log Transformed Data			95% UCL	Max	EPC
	n	standard deviation	mean	**H-value**	**mg/kg**	**mg/kg**	**mg/kg**
Aroclor 1254	9	1.110	-3.226	3.565	0.30	0.70	0.30
DDE	9	2.483	-3.355	7.147	403.83	4.48	4.48
Arsenic	9	0.622	2.135	2.510	17.82	23.90	17.82
B(a)P Eq. (BEQ)	10	0.763	-0.428	2.784	1.85	4.42	1.85

Table A.7.2 SWMU 136/ AOC 663 Hazard Quotients and Incremental Lifetime Cancer Risks

Incidental Surface Soil Ingestion

Chemical	Oral RfD Used (mg/kg-day)	Oral SF Used (mg/kg-day)-1	Future Resident adult Hazard Quotient	Future Resident child Hazard Quotient	Future Resident lwa ILCR	Site Worker adult Hazard Quotient	Site Worker adult ILCR
Aroclor 1254	2E-05	2	0.0204	0.190	9.3E-07	0.0073	1.0E-07
DDE	NA	0.34	ND	ND	2.4E-06	ND	2.7E-07
Arsenic	0.0003	1.5	0.081	0.76	4.2E-05	0.029	4.7E-06
Benzo(a)pyrene equiv.	NA	7.3	ND	ND	2.1E-05	ND	2.4E-06
Total Incidental Ingestion Pathway Risk & Hazard:			0.10	0.95	6.6E-05	0.04	7.4E-06

Dermal Contact With Surface Soil

Chemical	Dermal Adjustment	Oral RfD Used (mg/kg-day)	Oral SF Used (mg/kg-day)-1	Future Resident adult Hazard Quotient	Future Resident child Hazard Quotient	Future Resident lwa ILCR	Site Worker adult Hazard Quotient	Site Worker adult ILCR
Aroclor 1254	0.5	1E-05	4	0.0167	0.055	4.2E-07	0.0119	1.7E-07
DDE	0.5	NA	0.68	ND	ND	1.1E-06	ND	4.4E-07
Arsenic	0.2	6E-05	7.5	0.017	0.055	4.7E-06	0.012	1.9E-06
Benzo(a)pyrene equiv.	0.5	NA	14.6	ND	ND	9.5E-06	ND	3.9E-06
Total Dermal Pathway Risk & Hazard:				0.03	0.11	1.6E-05	0.02	6.4E-06
Sum of All Soil Pathways:				0.14	1.06	8.2E-05	0.06	1.4E-05

NOTES:

NA Not available

ND Not Determined due to lack of available information

ILCR Incremental Lifetime Cancer Risk

Dermal Adj. Dermal to absorbed dose adjustment factor is applied to adjust for Oral SF and RfD (i.e., the oral RfD is based on oral absorption efficiency which should not be applied to dermal exposure and dermal CDI)

Table A.7.3. SWMU 136/ AOC 663 Point Risk (1E-6)

	Aroclor 1254	Aroclor 1260	As	BEQ	Be	Cu	Ni	Zn	Sb	Hg	Tl	V
SF (ing)	2	2	1.5	7.3	4.3	NA	NA	NA	NA	NA	NA	NA
SF (der)	4	4	7.5	14.6	21.5	NA	NA	NA	NA	NA	NA	NA
DAF	0.01	0.01	0.001	0.01	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001

Residential

Boring No.		Aroclor 1254	DDE	As	BEQ	Be	Cu	Ni	Zn	Sb	Hg	Tl	V	Total Point Risk	Risk Above Background
663SB	1	0.2	0.1	15.1	5.4	-	-	-	-	-	-	-	-	20.9	0.3
663SB	2	0.2	0.1	8.9	7.6	-	-	-	-	-	-	-	-	16.8	1.2
663SB	4	0.2	20.3	48.8	7.7	-	-	-	-	-	-	-	-	77.0	29.3
663SB	5	0.2	1.8	14.1	8.3	-	-	-	-	-	-	-	-	24.4	3.6
663SB	6	0.1	0.0	23.5	7.7	-	-	-	-	-	-	-	-	31.3	1.1
663SB	7	0.1	0.4	16.2	73.3	-	-	-	-	-	-	-	-	90.0	67.1
663SB	9	-	-	-	8.0	-	-	-	-	-	-	-	-	8.0	1.3
136SB	2	3.2	0.1	19.1	21.8	-	-	-	-	-	-	-	-	44.2	18.4
136SB	3	0.1	0.0	29.8	7.8	-	-	-	-	-	-	-	-	37.7	1.3
136SB	4	0.1	0.0	62.4	10.5	-	-	-	-	-	-	-	-	73.1	25.4
Site Risk		1.4	3.5	46.5	30.6	-	-	-	-	-	-	-	-	82.0	-
Adj. Site Risk*		**1.4**	**3.5**	**5.5**	**23.9**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**34.3**

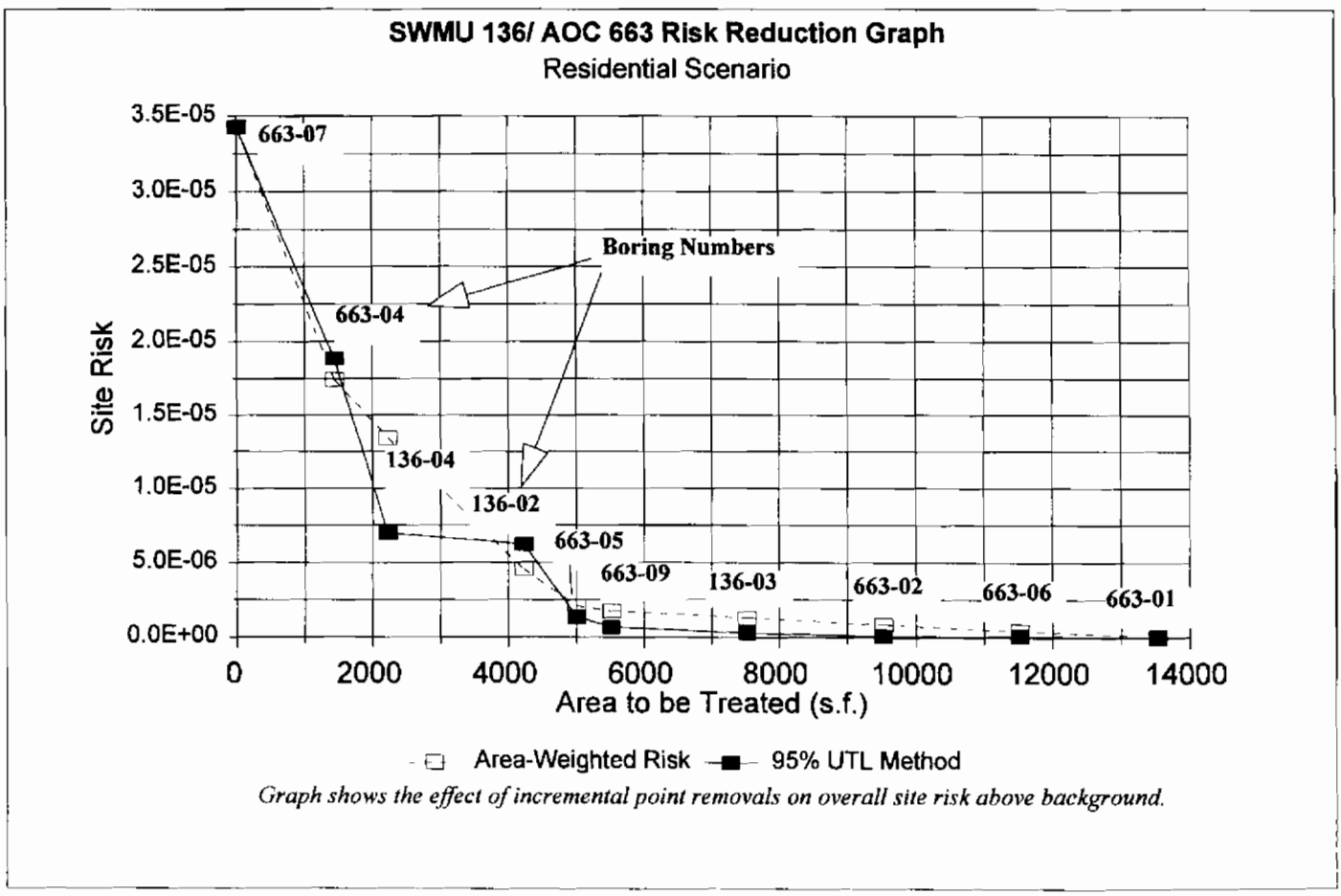
Industrial

Boring No.		Aroclor 1254	DDE	As	BEQ	Be	Cu	Ni	Zn	Sb	Hg	Tl	V	Total Point Risk	Risk Above Background
663SB	1	0.0	0.0	1.5	0.4	-	-	-	-	-	-	-	-	2.0	0.0
"	2	0.0	0.0	0.9	0.6	-	-	-	-	-	-	-	-	1.5	0.0
"	4	0.0	1.6	4.9	0.6	-	-	-	-	-	-	-	-	7.1	1.6
"	5	0.0	0.1	1.4	0.6	-	-	-	-	-	-	-	-	2.2	0.1
"	6	0.0	0.0	2.4	0.6	-	-	-	-	-	-	-	-	3.0	0.0
"	7	0.0	0.0	1.6	5.6	-	-	-	-	-	-	-	-	7.3	4.3
"	9	-	-	-	0.6	-	-	-	-	-	-	-	-	-	
136SB	2	0.2	0.0	1.9	1.7	-	-	-	-	-	-	-	-	3.8	0.5
"	3	0.0	0.0	3.0	0.6	-	-	-	-	-	-	-	-	3.6	0.0
"	4	0.0	0.0	6.3	0.8	-	-	-	-	-	-	-	-	7.1	0.5
Site Risk		0.3	0.7	6.6	6.2	-	-	-	-	-	-	-	-	13.8	-
Adj. Site Risk*		**0.3**	**0.7**	**0.8**	**4.8**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**6.6**

***Adj. Site Risk = Total Site Risk minus background risk for Arsenic (Res: 41E-6; Ind: 5.8E-6), Beryllium (Res.: 11E-6; Ind.: 1.5E-6), and BEQs (Res.: 6.7E-6; Ind.: 1.4E-6)**

Table A.7.4. SWMU 136/ AOC 663 Point Risk Reduction (1E-6)
Residential

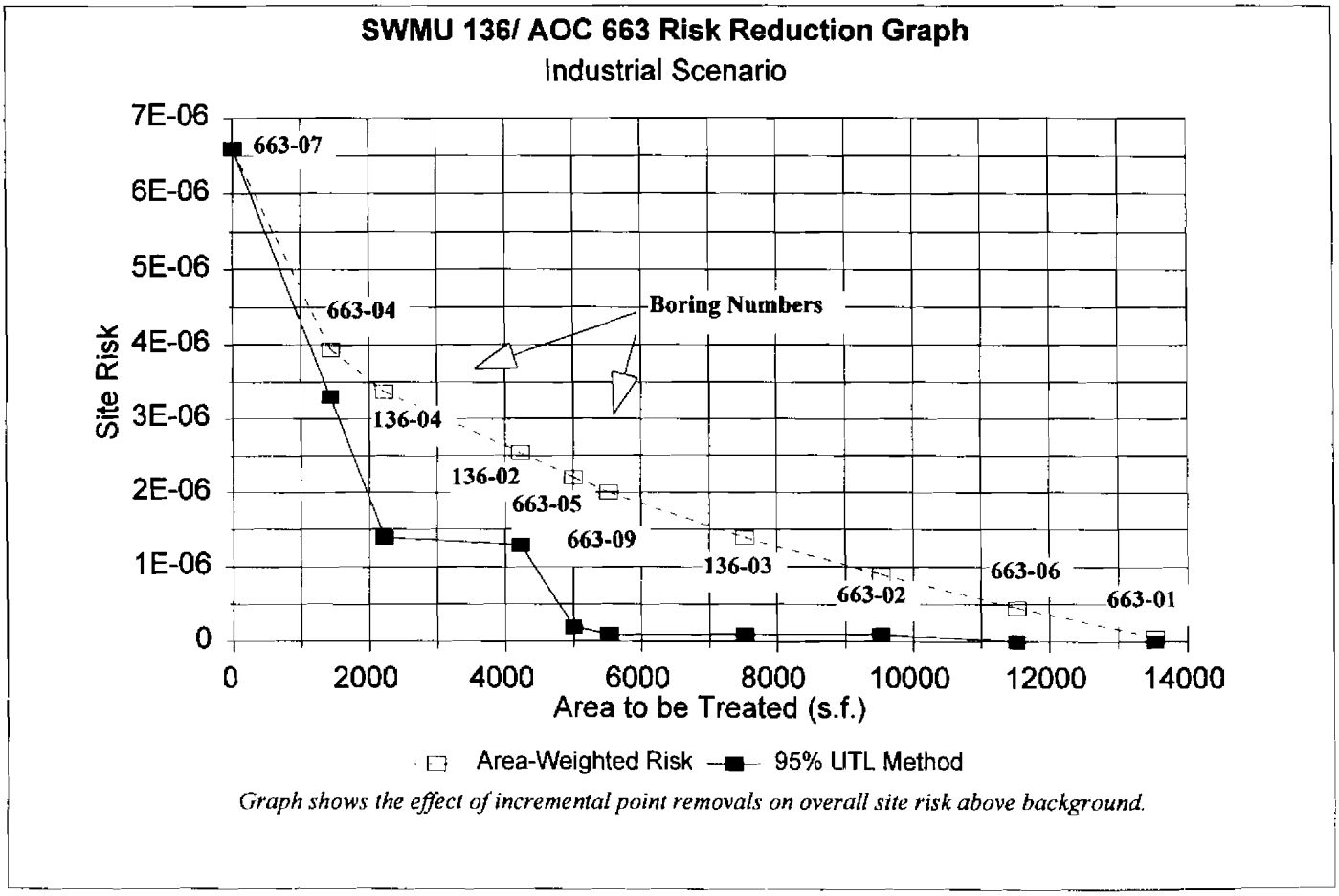
Point to be Removed		Estimated Area (s.f.)	Cumul. Area	Individual Point Risks		Area Weighted Point Risks		Site Risk Remaining After Point Removal		
				Total	Above Bkgd.	Total	Above Bkgd.	Total	AW Method Above Bkgd	UCL Method Above Bkgd
SB663	7	1438	1438	90.0	67.1	17.8	16.8	64.2	17.5	18.9
SB663	4	787	2225	77.0	29.3	8.3	4.0	55.9	13.5	7.0
SB136	4	2000	4225	73.1	25.4	20.1	8.9	35.7	4.6	6.3
SB136	2	782	5007	44.2	18.4	4.8	2.5	31.0	2.1	1.4
SB663	5	515	5522	24.4	3.6	1.7	0.3	29.3	1.8	0.7
SB663	9	2000	7522	8.0	1.3	2.2	0.5	27.1	1.3	0.3
SB136	3	2000	9522	37.7	1.3	10.4	0.5	16.7	0.9	0.1
SB663	2	2000	11522	16.8	1.2	4.6	0.4	12.1	0.4	0.1
SB663	6	2000	13522	31.3	1.1	8.6	0.4	3.5	0.1	0.0
SB663	1	1200	1200	20.9	0.3	3.5	0.1	-0.0	-0.0	0.0



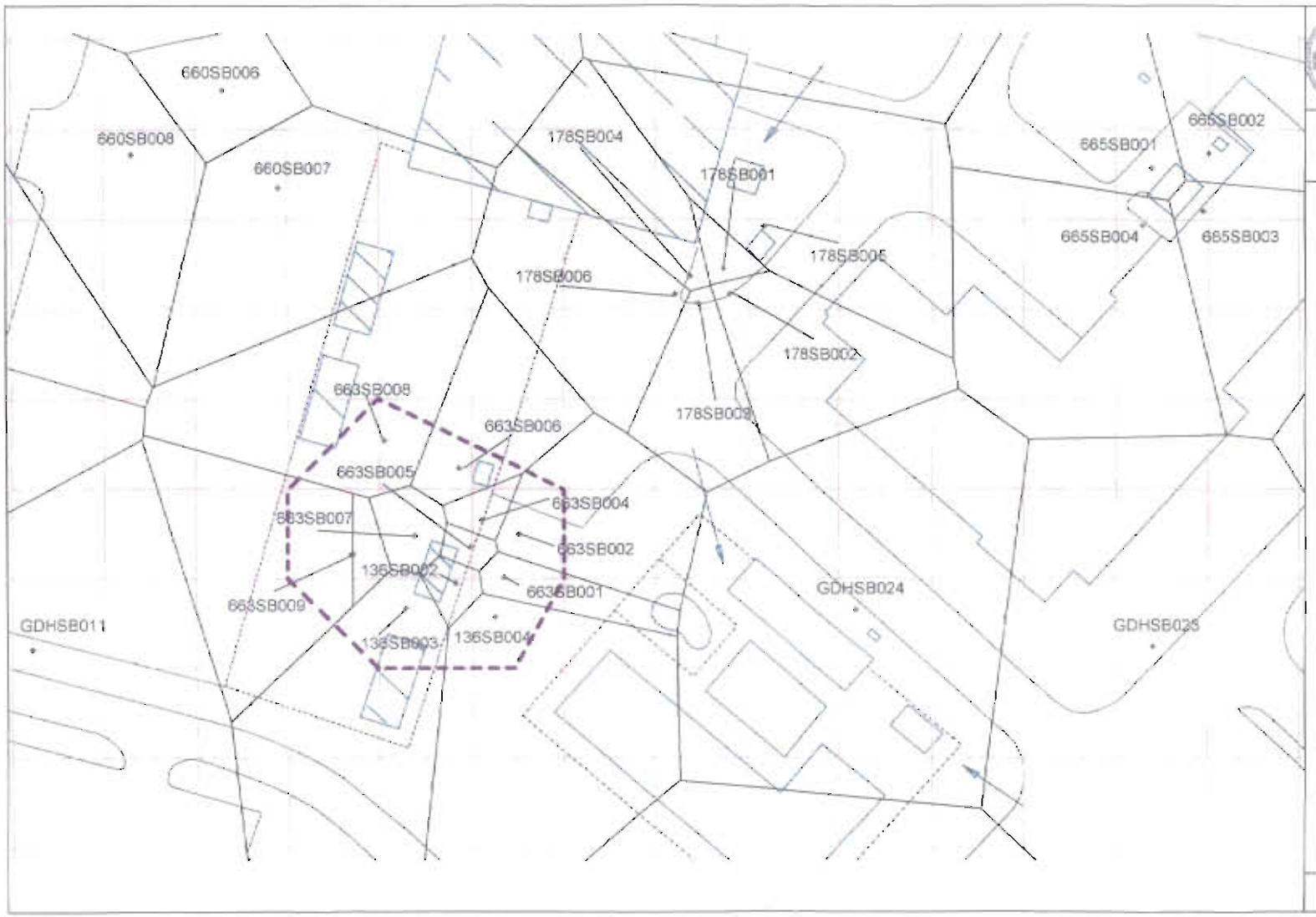
Graph shows the effect of incremental point removals on overall site risk above background.

Table A.7.5. SWMU 136/ AOC 663 Point Risk Reduction (1E-6) Industrial

Point to be Removed		Estimated Area (s.f.)	Cumul. Area	Individual Point Risks		Area Weighted Point Risks		Site Risk Remaining After Point Removal		
				Total	Above Bkgd.	Total	Above Bkgd.	Total	AW Method Above Bkgd	UCL Method Above Bkgd
SB663	7	1438	1438	13.2	9.7	2.7	2.7	11.1	3.9	3.3
SB663	4	787	2225	8.3	3.8	0.9	0.6	10.2	3.4	1.4
SB136	4	2000	4225	9	2.2	2.6	0.8	7.6	2.5	1.3
SB136	2	782	5007	7.4	2.2	0.8	0.3	6.8	2.2	0.2
SB663	5	515	5522	6.6	2.1	0.5	0.2	6.3	2.0	0.1
SB663	9	2000	7522	4.3	1.6	1.2	0.6	5.0	1.4	0.1
SB136	3	2000	9522	4.6	1.3	1.3	0.5	3.7	0.9	0.1
SB663	2	2000	11522	5.8	1.2	1.7	0.5	2.1	0.4	0.0
SB663	6	2000	13522	4.4	1	1.3	0.4	0.8	0.1	0.0
SB663	1	1200	14722	4.7	0.3	0.8	0.1	0.0	0.0	0.0



Graph shows the effect of incremental point removals on overall site risk above background.



Charleston Naval Base
Zone H
Corrective Measures
Work Plan

AOC 663 and SWMU 136
Thiessen Soil Risk Reduction Polygons

Soil_pts.shp
Soil Sample Locations
Soil_the.shp
Risk -- Thiessen polygons
Grid_50.shp
50 -Foot Grid
Water
Pier
Road
Bldg
Fence

N
W
E
S

1:58

Table A.8.1 AOC 666 Surface Soil Concentration Summary

Boring No.		Aroclor1254 mg/kg	Aroclor1260 mg/kg	As mg/kg	BEQ mg/kg	Be mg/kg	Cu mg/kg	Ni mg/kg	Zn mg/kg
666SB	1	0.02	0.02	6.0	0.44	NA	NA	NA	NA
666SB	2	0.02	0.02	16.5	3.41	NA	NA	NA	NA
666SB	3	0.02	0.02	1.0	0.44	NA	NA	NA	NA
666SB	4	0.02	0.02	30.5	0.93	NA	NA	NA	NA
666SB	5	0.02	0.09	3.1	4.62	NA	NA	NA	NA
666SB	6	0.02	0.02	0.29	0.84	NA	NA	NA	NA
666SB	7	0.02	0.02	2.8	0.44	NA	NA	NA	NA

Note: shaded values were not detected; value given represents ½ the SQL.

NA compound concentrations detected do not significantly contribute to risk or hazard

	Log Transformed Statistics				95% UCL	Max. Observed Concentration	EPC
	n	Standard Deviation	Mean	H-value	mg/kg	mg/kg	mg/kg
Aroclor 1254	17	NA	NA	NA	NA	NA	NA
Aroclor 1260	17	0.562	-3.700	2.108	0.04	0.0884	0.04
Arsenic	17	1.592	1.277	3.678	55.07	30.5	30.50
BAP Eq. (BEQ)	17	1.045	-0.104	2.756	3.20	4.622	3.20

Table A.8.2 AOC 666 Hazard Quotients and Incremental Lifetime Cancer Risks

Incidental Surface Soil Ingestion

Chemical	Oral RfD Used (mg/kg-day)	Oral SF Used (mg/kg-day)-1	Future Resident adult Hazard Quotient	Future Resident child Hazard Quotient	Future Resident Iwa ILCR	Site Worker adult Hazard Quotient	Site Worker adult ILCR
Aroclor 1254	2E-05	2	ND	ND	0.0E+00	ND	0.0E+00
Aroclor 1260	NA	2	ND	ND	1.2E-07	ND	1.4E-08
Arsenic	0.0003	1.5	0.139	1.30	7.2E-05	0.050	8.0E-06
BAP Eq. (BEQ)	NA	7.3	ND	ND	3.7E-05	ND	4.1E-06
Total Incidental Ingestion Pathway Risk & Hazard:			0.1	1.3	1.1E-04	0.0	1.2E-05

Dermal Contact With Surface Soil

Chemical	Dermal Adjustment	Oral RfD Used (mg/kg-day)	Oral SF Used (mg/kg-day)-1	Future Resident adult Hazard Quotient	Future Resident child Hazard Quotient	Future Resident Iwa ILCR	Site Worker adult Hazard Quotient	Site Worker adult ILCR
Aroclor 1254	0.5	1E-05	4	ND	ND	0.0E+00	ND	0.0E+00
Aroclor 1260	0.5	NA	4	ND	ND	5.5E-08	ND	2.2E-08
Arsenic	0.2	6E-05	7.5	0.029	0.094	8.0E-06	0.020	3.3E-06
BAP Eq. (BEQ)	0.5	NA	14.6	ND	ND	1.6E-05	ND	6.7E-06
Total Dermal Pathway Risk & Hazard:				0.03	0.09	2.5E-05	0.02	1.0E-05
Sum of All Soil Pathways:				1.7E-01	1.4E+00	1.3E-04	7.0E-02	2.2E-05

NOTES:

NA Not available

ND Not Determined due to lack of available information

ILCR Incremental Lifetime Cancer Risk

Dermal Adj. Dermal to absorbed dose adjustment factor is applied to adjust for Oral SF and RfD (i.e., the oral RfD is based on oral absorption efficiency which should not be applied to dermal exposure and dermal CDI)

Table A.8.3. AOC 666 Point Risk Summary (1E-6)

	Aroclor 1254	Aroclor 1260	As	BEQ	Be	Cu	Ni	Zn
SF (ing)	2	2	1.5	7.3	4.3	NA	NA	NA
SF (der)	4	4	7.5	14.6	21.5	NA	NA	NA
DAF	0.01	0.01	0.001	0.01	0.001	0.001	0.001	0.001

Residential

Boring No.		Aroclor 1254	Aroclor 1260	As	BEQ	Be	Cu	Ni	Zn	Total Point Risk	Risk Above Background
666SB	1	0.1	0.1	15.7	7.3	-	-	-	-	23.1	0.8
666SB	2	0.1	0.1	43.1	56.5	-	-	-	-	99.8	52.1
666SB	3	0.1	0.1	2.6	7.3	-	-	-	-	10.1	0.8
666SB	4	0.1	0.1	79.7	7.1	-	-	-	-	86.9	39.2
666SB	5	0.1	0.4	8.1	76.5	-	-	-	-	85.1	70.3
666SB	6	0.1	0.1	0.8	14.0	-	-	-	-	14.9	7.5
666SB	7	0.1	0.1	7.3	7.3	-	-	-	-	14.8	0.8
Site Risk		0.0	0.2	79.7	53.0	-	-	-	-	132.8	-
Adj. Site Risk*		**0.0**	**0.2**	**38.7**	**46.3**	**0.0**	**-**	**-**	**-**	**-**	**85.1**

Industrial

Boring No.		Aroclor 1254	Aroclor 1260	As	BEQ	Be	Cu	Ni	Zn	Total Point Risk	Risk Above Background
019SB	1	0.0	0.0	1.6	0.6	-	-	-	-	2.1	0.01
"	2	0.0	0.0	4.3	4.4	-	-	-	-	8.7	2.97
"	3	0.0	0.0	0.3	0.6	-	-	-	-	0.8	0.01
"	4	0.0	0.0	8.0	0.5	-	-	-	-	8.6	2.21
"	5	0.0	0.0	0.8	5.9	-	-	-	-	6.7	4.54
"	6	0.0	0.0	0.1	1.1	-	-	-	-	1.2	0.01
"	7	0.0	0.0	0.7	0.6	-	-	-	-	1.3	0.01
Site Risk		0.0	0.0	11.3	10.8	-	-	-	-	22.1	-
Adj. Site Risk*		**0.0**	**0.0**	**5.5**	**9.4**	**0.0**	**-**	**-**	**-**	**-**	**14.9**

***Adj. Site Risk = Total Site Risk minus background risk for Arsenic (Res: 41E-6; Ind: 5.8E-6), Beryllium (Res.: 11E-6; Ind.: 1.5E-6), and BEQs (Res.: 6.7E-6; Ind.: 1.4E-6)**

Table A.8.4. AOC 666 Point Hazard Summary (1E-6)

	Aroclor 1254	Aroclor 1260	As	BEQ	Be	Cu	Ni	Zn
SF (ing.)	2	2	1.5	7.3	4.3	NA	NA	NA
SF (derm.)	4	4	7.5	14.6	21.5	NA	NA	NA
DAF	0.01	0.01	0.001	0.01	0.001	0.001	0.001	0.001
Oral RfD (ing.)	2E-05	NA	0.0003	NA	0.005	3.5	0.02	0.3
Oral RfD (derm.)	1E-05	NA	6E-05	NA	0.001	0.7	0.004	0.06

Residential

Boring No.		Aroclor 1254	Aroclor 1260	As	BEQ	Be	Cu	Ni	Zn	Total Point Hazard	Hazard Above Background*
019SB	1	0.02	NA	0.27	NA	-	-	-	-	0.3	0.00
"	2	0.02	NA	0.75	NA	-	-	-	-	0.8	0.04
"	3	0.02	NA	0.05	NA	-	-	-	-	0.1	0.00
"	4	0.02	NA	1.39	NA	-	-	-	-	1.4	0.68
"	5	0.02	NA	0.14	NA	-	-	-	-	0.2	0.00
"	6	0.02	NA	0.01	NA	-	-	-	-	0.0	0.00
"	7	0.02	NA	0.13	NA	-	-	-	-	0.1	0.00
Site Hazard		0.00	NA	1.33	NA	-	-	-	-	1.3	-
Site Hazard Above Bkgd.		**0.00**	**NA**	**0.62**	**NA**	**-**	**-**	**-**	**-**	**-**	**0.62**

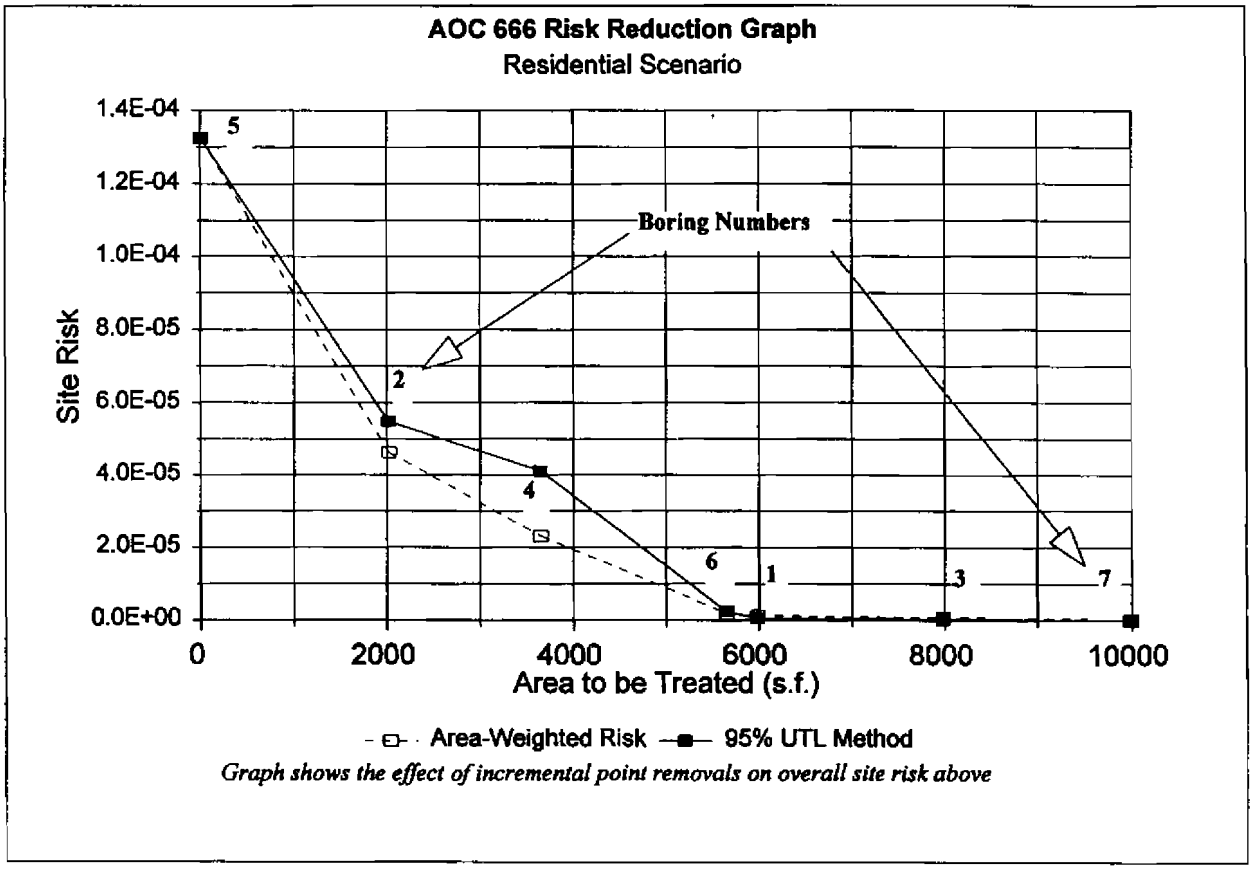
Industrial

Boring No.		Aroclor 1254	Aroclor 1260	As	BEQ	Be	Cu	Ni	Zn	Total Point Hazard	Hazard Above Background*
019SB	1	0.00	NA	0.01	NA	-	-	-	-	0.0	0.00
"	2	0.00	NA	0.04	NA	-	-	-	-	0.0	0.00
"	3	0.00	NA	0.00	NA	-	-	-	-	0.0	0.00
"	4	0.00	NA	0.07	NA	-	-	-	-	0.1	0.00
"	5	0.00	NA	0.01	NA	-	-	-	-	0.0	0.00
"	6	0.00	NA	0.00	NA	-	-	-	-	0.0	0.00
"	7	0.00	NA	0.01	NA	-	-	-	-	0.0	0.00
Site Hazard		0.00	NA	0.07	NA	-	-	-	-	0.1	-
Site Hazard Above Bkgd.		**0.00**	**NA**	**0.03**	**NA**	**-**	**-**	**-**	**-**	**-**	**0.03**

***Adj. Site Hazard = Total Site Hazard minus background hazard for Arsenic (Res: 0.71; Ind: 0.04), Beryllium (Res.: 0.0038; Ind.: app. 0), Copper (Res.: 0.0095; Ind. app. 0), Nickel (Res.: 0.023; Ind. app. 0), and Zinc (Res.: 0.0098; Ind. app. 0)**

Table A.8.5 AOC 666 Residential Point Risk Reduction (1E-6)

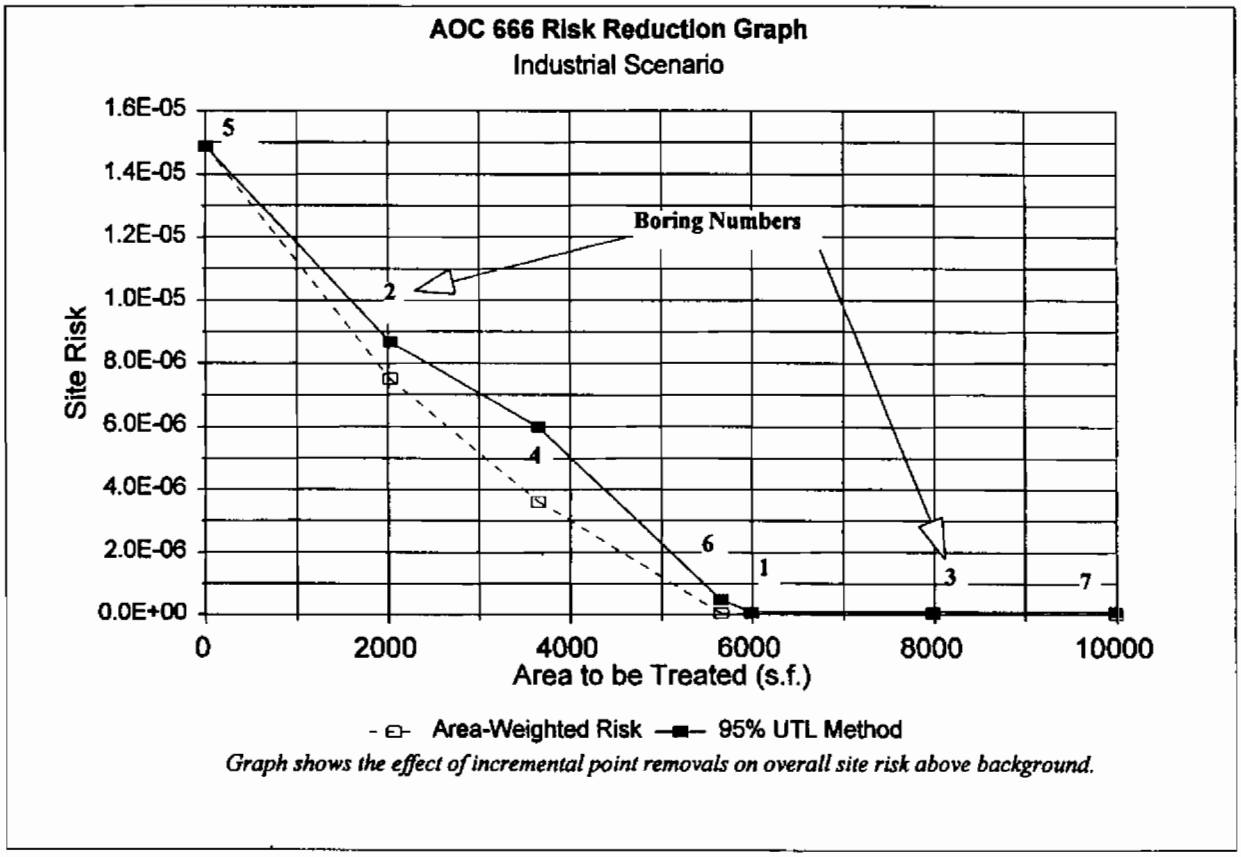
Point to be Removed		Estimated Area (s.f.)	Cumul. Area	Individual Point Risks		Area Weighted Point Risks		Site Risk Remaining After Point Removal		
				Total	Above Bkgd.	Total	Above Bkgd.	Total	AW Method Above Bkgd	UCL Method Above Bkgd
666SB	5	2022	2022	85.1	70.3	37.5	38.7	95.3	46.4	54.8
666SB	2	1631	3653	99.8	52.1	35.5	23.1	59.9	23.3	41.2
666SB	4	2000	5653	86.9	39.2	37.9	21.3	22.0	2.0	2.5
666SB	6	329	5982	14.9	7.5	1.1	0.7	20.9	1.3	0.7
666SB	1	2000	7982	23.1	0.8	10.1	0.4	10.9	0.9	0.4
666SB	3	2000	9982	10.1	0.8	4.4	0.4	6.4	0.4	0.1
666SB	7	2000	11982	14.8	0.8	6.4	0.4	-0.0	0.0	0



Graph shows the effect of incremental point removals on overall site risk above

Table A.8.6 AOC 666 Industrial Point Risk Reduction (1E-6)

Point to be Removed		Estimated Area (s.f.)	Cumul. Area	Individual Point Risks		Area Weighted Point Risks		Site Risk Remaining After Point Removal		
				Total	Above Bkgd.	Total	Above Bkgd.	Total	AW Method Above Bkgd	UCL Method Above Bkgd
666SB	5	2022	2022	6.7	4.5	5.6	7.4	16.5	7.5	8.7
666SB	2	1631	3653	8.7	3.0	5.8	3.9	10.7	3.6	6
666SB	4	2000	5653	8.6	2.2	7.0	3.6	3.7	0.1	0.5
666SB	6	329	5982	1.2	0.0	0.2	0.0	3.5	0.1	0.1
666SB	1	2000	7982	2.1	0.0	1.8	0.0	1.8	0.0	0.1
666SB	3	2000	9982	0.8	0.0	0.7	0.0	1.1	0.0	0.1
666SB	7	2000	11982	1.3	0.0	1.1	0.0	0.0	0.0	0



Graph shows the effect of incremental point removals on overall site risk above background.